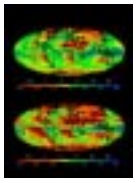
UCRL-MI-122902



Visualization and Computation System (VCS)

User's Guide

by Dean N. Williams

The Program for Climate Model Diagnosis and Intercomparison (PCMDI) has developed the Visualization and Computation System (VCS) computer software for the selection, manipulation, and display of scientific data. By specification of the desired data, the graphics method, and the display template, the VCS user gains virtually complete control of the appearance of the data display and associated text and animation. In addition to operating in a fully interactive mode, the user can run VCS from a script file, or can alternate between interactive and script modes.

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1. Setup Information

This chapter--the recommended starting point for VCS users--provides basic setup information, including instructions on configuring and running VCS in interactive vs batch mode, as well as an initial orientation to using the software.

Other chapters of this User's Guide contain tutorial Examples on how to exercise different software capabilities, Hints on the features and functions of each interactive panel, and details on VCS Scripts.

1.1 Before Running VCS

The steps that should be followed before running VCS are described in this section. These include putting in place various input files, setting fonts for XGKS, and adding additional continental map files if desired.

Recommended Input Files

It is strongly recommended that two input files be put in place before attempting to run VCS. These include a file for specifying initial attributes and a file for printing hard copy. See also instructions on other input files for setting XGKS fonts, mapping continents, and running scripts in subsequent sections.

File for Specifying Initial Attributes

At start-up, VCS reads a script file named ***initial.attributes*** that defines the initial appearance of the VCS Interface. Although not required to run VCS, this ***initial.attributes*** file contains many predefined settings to aid the beginning user of VCS. The path to the file *must* be:

/$HOME/PCMDI_GRAPHICS/initial.attributes

where ***/$HOME*** denotes the user's home directory. (*Note, when VCS is executed for the first time, a* ***/PCMDI_GRAPHICS*** *subdirectory will be created automatically if it has not already been created*.)

Changing the initial.attributes File

The contents of the ***initial.attributes*** file can be customized by the user. This is most easily accomplished in interactive mode by bringing the VCS Interface to a state having the desired appearance at start-up, and then saving this state by accessing the Script I/O Panel and selecting the blue 'Replace the initial.attributes File' button there. This action will place a new ***initial.attributes*** file with the desired settings in the user's

/$HOME/PCMDI_GRAPHICS

directory. For recovery purposes, the old ***initial.attributes*** file is copied to file ***initial.attributes%*** in the same directory.

File for Printing

VCS graphical displays can be printed only if the user customizes a ***HARD_COPY*** file (included with the VCS software) for the home system. The path to the ***HARD_COPY*** file *must* be:

/$HOME/PCMDI_GRAPHICS/HARD_COPY

where ***/$HOME*** denotes the user's home directory. The ***HARD_COPY*** file contains the following necessary information for printing at the user's home site:

- A list of the available home Postscript printing devices.

- The absolute path on the home system to the **gplot** executable (provided with the VCS software) that converts files in the Computer Graphics Metafile (CGM) format to Postscript files.
- Instructions for setting the environment aliases 'landscape' and 'portrait' that are used to generate Postscript files outside VCS.
- The setting for the environment variable 'PRINTER'. (*When 'PRINTER' is set to 'printer', VCS assumes that the printer manager 'lpr' is in use; when 'PRINTER' is unset, VCS assumes that the printer manager is 'lp'. Incidences of the message* **"Error - In sending CGM file to printer"** *are an indication of an incorrect setting for the 'PRINTER' environment variable.*)

Note, it is recommended that VCS users read the entire contents of the ***HARD_COPY*** *file for additional information on printing in VCS.* See also the Example on Printing CGM Files and Hints on the Print CGM Panel.

Setting XGKS Fonts

XGKS is an implementation of the ANSI Graphical Kernel System in C, the programming language used to develop VCS. XGKS fonts pertain to those used for graphical displays on the VCS Canvas.

Before running VCS, it is necessary to set the environment variable **XGKSFontDir**. That is, enter:

setenv XGKSFontDir ***/the_absolute_path/fontdb.SGI*** for SGI

setenv XGKSFontDir ***/the_absolute_path/fontdb.Solaris*** for Sun Solaris

setenv XGKSFontDir ***/the_absolute_path/fontdb.DEC*** for DEC Alpha

etc...

where **/the_absolute_path** denotes the absolute path on the user's home system to the relevant ***fontdb*** file.

It is best if this **setenv** statement is included in the ***.login*** or ***.cshrc*** file located in the user's home directory (***/$HOME***).

Note, if VCS aborts with the message:

"XGKS: can't load font 1 from path ./fontdb - aborting"

then the **XGKSFontDir** *variable is improperly set.*

Nine XGKS font styles are supported:

- SanSerif Roman
- Serif Roman
- Sanserif Bold Roman
- Serif Bold Roman
- Sanserif Italic Roman
- Serif Italic Roman
- Sanserif Script
- Serif Script
- Gothic

See the Hints on the Text Editor Panel for information on how to choose the desired XGKS font style within VCS.

See also information below on the user's option of setting fonts for the VCS windows (other than the VCS Canvas)

when running in interactive mode.

Continents Mapping Options

One has the option of using continental maps that are predefined or that are user-defined. Predefined continental maps are either internal to VCS or are specified by external files. User-defined continental maps are specified by additional external files that must be read as input.

Internal Continents

VCS has two internal continents maps: "Fine Continents" and "Coarse Continents". The "Fine Continents" map includes smaller islands and highly detailed coastlines, while the "Coarse Continents" map excludes these features. If continents are not defined by the user or if specified continents are not found by VCS, then the "Fine Continents" map is used as the default.

External Continents

Included with the VCS executable are three ASCII continent files: the ***data_continent_states*** ("United States") file includes "Fine Continents" and the boundaries of the 48 continental United States; the ***data_continent_political*** ("Political Borders") file includes "Fine Continents" and political borders of sovereign countries; and the ***data_continent_river*** ("Rivers") file includes "Fine Continents" and major *North American* rivers. (*It is anticipated that a world rivers file will be made available at a later date.*)

These external continent files *must* be located in the user's

$HOME/PCMDI_GRAPHICS

directory. If VCS cannot find a specified external continents file, then it will use "Fine Continents" as the default.

Adding Additional External Continents

As many as six additional continental map files can be defined by the user. These files *must* be located in the user's

$HOME/PCMDI_GRAPHICS

directory and *must* be named: ***data_continent_other7***, ***data_continent_other8***, *...* , ***data_continent_other12***, respectively.

The ASCII format for the external continents files is:

number of x-y coordinates; **line-type value**; **values of x-y coordinates**

The number of x-y coordinates is *twice* the number of map points to be connected by the defined continental line type. A *maximum of 100 map points (200 x-y coordinates) are allowed.*

The line-type values are integers ranging from **0** to **11**, where:

0 signifies "No Continents"

1 signifies "Fine Continents"

2 signifies "Coarse Continents"

3 signifies "United States" (with "Fine Continents")

4 signifies "Political Borders" (with "Fine Continents")

5 signifies "Rivers" (with "Fine Continents")

Values **6** through **11** signify the line type defined by the files ***data_continent_other7*** through ***data_continent_other12***.

The x-y coordinates are pairs of floating-point values having units of degrees longitude-degrees latitude, respectively.

Consider the following example:

```
6  1 102.500 63.500 105.000 73.550 107.500 66.000
8 7 98.500 45.000 101.000 47.500 103.500 40.000 101.000 42.500
...
-99 -99
```

The first line specifies that continental line-type value **1** (i.e., "Fine Continents") is to be used to connect 3 points whose 6 x-y coordinates are 102.500 degrees longitude-63.500 degrees latitude, 105.000 degrees longitude-73.550 degrees latitude, 107.500 degrees longitude-66.000 degrees latitude.

The second line of this example specifies that user-defined continental line-type value **7** is to be used to connect 4 points whose 8 x-y coordinates are 98.500 degrees longitude-45.000 degrees latitude, 101.000 degrees longitude-47.500 degrees latitude, 103.500 degrees longitude-40.000 degrees latitude, 101.000 degrees longitude-42.500 degrees latitude.

The entries **-99 -99** indicate that no more data are to be read in (i.e., denotes end-of-file).

It is recommended that the user view the other external continents files (e.g., ***data_continent_states***) for further insights on the required ASCII format. See also the Example on Changing the Continental Outlines for information on how to implement these mapping options within VCS.

1.2 Running VCS: Command Line Options

The software can be run either interactively by use of the VCS Interface or in batch mode by use of VCS scripts (or in a combination of these modes). The following paragraphs describe how to exercise various options in executing VCS in these modes.

Running in Interactive Mode

To execute VCS in interactive mode, it is sufficient to enter

vcs

on the command line. It then will take a few moments for the VCS Interface to appear in an initial state determined by the settings in the ***initial.attributes*** **file**. (In this case, the VCS Interface will take up the entire monitor screen.) Options for executing VCS subject to additional criteria are described below.

Setting the Window Geometry

The VCS Interface need not occupy the entire monitor screen (the default condition). The preferred size and position of the VCS window can be specified at the command line:

vcs -geom (width) x (height) + x_position + y_position

Here **width** represents the desired window length on the x axis, and **height** represents the desired window length on the y axis, where both are expressed in *screen pixel units*. Here also **x_position** represents the window's top left x-corner position, and **y_position** represents the window's top left y-corner position (both expressed in screen pixel units).

Setting Window Fonts

The font to be used by the window managers (as distinct from the XGKS fonts that pertain to the VCS Canvas) also

can be (*but need not be*) specified at the command line:

vcs -font "font_name"

The **font_name** is a hyphenated string that *must be surrounded by quotes* ("..."). It takes the form

"-fndry-family-weight-slant-swidth-adstyl-pxlsz-ptSz-resx-resy-spc-avgwidth-rgstry-encdng"

Examples of **font_names**:

"-adobe-courier-bold-r-normal--14-140-75-75-m-90-iso8859-1" (the VCS default)
"-bitstream-charter-medium-r-normal--9-60-72-0-*-77-iso8859-1"
"-*-times-*-r-*-*-17-*-*-*-*-*-*-*"

Note, however, that parts of the VCS Interface may become distorted with the selection of too small or large a font.

Running in Quiet Mode:

During an interactive session, VCS can be run in quiet mode (i.e., without sound signals accompanying status messages) by entering:

vcs -quiet

Creating a Continuous Script:

A continuous script file to record all operations performed during an interactive VCS session can be saved by assigning an output file on the command line:

vcs -o */path/output_script_filename*

The replay of this output script file will *not* reproduce the manipulations of buttons and menus that are seen during the interactive session, but will reproduce the graphics displays. The appropriate output files also will be saved.

Running in Batch Mode

In executing VCS in batch mode, a script file is read immediately after the ***initial.attributes*** file. The script file for batch-mode operation is assigned on the command line as follows:

vcs -i */path/input_script_filename*

While reading this script file, VCS proceeds in batch mode, where only the VCS Canvas appears, displaying plots. After completion of the script, the VCS Interface appears showing the last plot displayed in batch mode. On option, other script files then can be selected as input for an interactive session with VCS.

To avoid display of the VCS Interface after executing the input script, enter the following:

vcs -ni */path/input_script_filename*

While reading this script file, VCS proceeds in batch mode, where only the VCS Canvas appears, displaying plots. After completion of the script, VCS will exit without displaying the VCS Interface.

See also the Examples on Saving and Running Scripts and on Running in Noninteractive Modes. See the chapter on VCS Scripts for details on script syntax.

1.3 An Orientation to Using VCS

The following information orients the new user to basic VCS concepts, terminology, and operations, with an emphasis on use of the software in interactive mode. See the Example on Running in Noninteractive Modes and the chapter on VCS Scripts for details on running the software in batch mode.

The VCS Model

Primary Elements

In the VCS model, the data display is defined by a trio of named attribute sets, designated the *primary elements*. These include: the data, which define what is to be displayed; the picture template, which determines the appearance of each segment of the display; and the graphics method, which specifies the display technique. Panels for manipulating these primary elements are color-coded in the VCS Interface: attributes associated with the data are represented in red, those with the graphics method in blue, and those with the picture template in green.

Secondary Elements

In addition, detailed specification of the primary elements' attributes is provided by eight *secondary elements*:

- colormap: specification of combinations of 256 available colors
- fill area: style, style index, and color index
- format: specifications for converting numbers to display strings
- line: line type, width, and color index
- list: a sequence of pairs of numerical and character values
- marker: marker type, size, and color index
- text: text font type, character spacing, expansion, and color index
- text orientation: character height, angle, path, and horizontal/vertical alignment

The ***initial.attributes*** file specifies the tables of primary and secondary element attributes assigned at the beginning of a VCS session. The user may subsequently modify these attributes.

Software Capabilities

By combining primary and secondary elements in various ways (either interactively through operations performed on VCS panels or in batch mode by use of VCS scripts), the VCS user exercises virtually complete control over the appearance of the data display. Among other capabilities, the user can:

- ingest data written in netCDF, HDF, DRS, GrADS, or GRIB data file formats
- browse data directories and read these file formats quickly
- display variables via default settings
- view, select and modify attributes of data variables and of their dimensions
- create and modify existing template attributes and graphics methods
- save the state of the system as a script to be run interactively or in batch mode
- save a display as a Computer Graphics Metafile (CGM), raster, or Postscript file
- perform grid transformations and compute new data variables
- create and modify colormaps

- zoom into a specified portion of a display or the VCS Canvas
- change the orientation (portrait vs. landscape) or size (partial vs. full-screen) of a display
- animate a single data variable or more than one data variable simulataneously
- save modified data variables in netCDF-, HDF-, or DRS-formatted files.

The VCS Interface

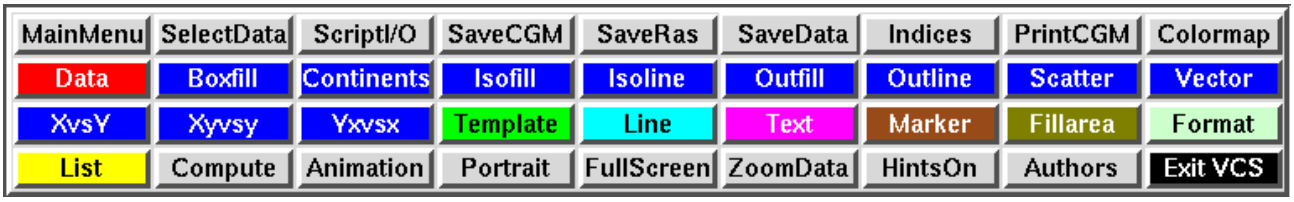
The VCS Interface (see figure) is the means by which the software is used in an interactive mode. The left half of the VCS Interface, whose appearance remains the same during an entire interactive session, consists of the Main Menu, the Message Panel, and the VCS Canvas. The right half of the VCS Interface changes in appearance according to which VCS panels are accessed by the user. Initially, however, the right half of the VCS Interface includes (see figure): a Page Description Panel; Template, Graphics Method, and Data Panels; and Data Selection and Data Selection Browser Panels .

The Main Menu

The Main Menu, which occupies the top-left portion of the VCS Interface, is the means by which many VCS panels are accessed (the remainder being accessed from panels brought up via the Main Menu). The Main Menu may be displayed either in compact or in full view:

Main Menu - Compact View

Main Menu - Full View as an Imagemap (Click on the Buttons)



When displayed in compact view, each pulldown menu has a tear-off selection, which appears as a dashed line in the first menu element. The tear-off enables the menu selections to be retained on the display to facilitate subsequent operations. *Note, panel-access instructions in this User's Guide (as well as in Hints displays within VCS) assume that the Main Menu is displayed in* ***compact view****.*

To display the Main Menu in full view, select the 'View All Menu Items' from the 'File' category of the compact Main Menu (i.e., Main Menu: 'File' - 'View All Menu Items'). (To revert to compact view, select the 'Main Menu' button in the upper left corner of the full-view display.) To initiate VCS with the Main Menu in full view, save the state of a VCS session with the Main Menu in this mode as a new ***initial.attributes*** file.

The Message Panel

The Message Panel is located below the Main Menu in the left half of the VCS Interface. Status messages confirming the execution of various operations in VCS, as well as error messages indicating the failure of intended actions, appear on the Message Panel during the course of a VCS interactive session. If VCS is *not* run in quiet mode, these messages will be accompanied by sound signals.

The VCS Canvas

The VCS Canvas, located below the Message Panel in the bottom left half of the VCS Interface, is the space in which data variables are displayed by means of eleven different graphics methods in VCS. The VCS Canvas may be expanded to take up the full size of the VCS Interface. A variety of other options also are available (see Hints on the VCS Canvas).

VCS Panels

Some 44 panels are required to fully exercise the capabilities of VCS. As an interactive session proceeds, some VCS panels cover others that were accessed previously. As necessary, the display of any covering panel may be turned off (thereby revealing an underlying panel) by selecting the 'Skull and Crossbones' button  that is located in the upper left corner of each VCS panel.

Use of Mouse Buttons

In using VCS interactively, all 3 mouse buttons are utilized. Overall, the left button is used most frequently, while the right button is used least frequently.

The left button is used for *selection* in VCS (as it is in any X-window/Motif environment). Selection involves a two-stage process in which the user moves the mouse pointer to a particular point on the screen (e.g., over the red 'Apply' button on the VCS Interface) and then presses the left mouse button. (*Note, where a selection process is described in other words in the VCS documentation--e.g., as in "press the red 'Apply' button"--it should be understood that selection with the left mouse button is intended*.)

Sometimes selection involves *clicking* (i.e., pressing and releasing in quick succession) the left button once or twice (e.g., when selecting a data variable using the Data Selection Panel--see also Step 3 of the Example on Creating Plots by Different Graphics Methods). In other instances, selection involves *pressing and holding* the left button until another operation (e.g., highlighting a particular item in a popup menu) is completed; only then is the left button released.

The middle mouse button is used for *copy and drop* operations in VCS. A typical example is:

- copying a data attribute set by moving the pointer over its name displayed in the red Data Panel and clicking the middle mouse button,

  then...

- moving the pointer to the picture descriptor form's red input text window and clicking the middle mouse button again.

This two-step operation effects a *copy* of the data attribute set from the Data Panel and a *drop* of the data attribute set onto the picture descriptor form, which causes the data to be plotted on the VCS Canvas.

The right button is used for *deletion* in VCS, as for example when deleting a data attribute set name from the red Data Panel.

Note, in a few instances the left, middle, and right mouse buttons are utilized differently than described above (e.g.,

in using the Colormap Editor/Table Panel, the Dimension Manipulation Panel, and the VCS Canvas). Where this is the case, the required mouse-button operations are spelled out clearly in the documentation.

Further Help with VCS

Hints Displays

When any panel is accessed interactively within VCS, a brief description of its purpose and basic instructions on its use are provided--at the user's option--in the form of Hints displays (also reproduced in this User's Guide). *Note, because they cover other VCS panels, the Hints displays must be moved aside as VCS is operated. The more experienced user may therefore wish to turn off these Hints displays.*

Turning Off Hints Displays

When 'Hints On' is specified (via Main Menu: 'Info' - 'Hints On'), selection of a VCS panel causes display of associated Hints. Turn off these Hints via Main Menu:'Info' - 'Hints Off'. To initiate VCS without displaying Hints, save the state of a VCS session with the Hints turned off as a new ***initial.attributes*** file.

Other Help

In addition to the Hints, numerous tutorial Examples are included in this User's Guide to illustrate how to perform functions that often require more than one VCS panel. The Examples are divided according to the one's skill level (i.e., "Beginning", "Intermediate", and "Advanced"). It is recommended that the user first follow an appropriate example to learn how to perform the rudiments of a desired VCS function, and then refer to the associated Hints for supplemental information.

Finally, for those interested in running VCS in batch mode, this User's Guide also documents the details of VCS Scripts. *Note, unlike the Hints, the Examples and Scripts documentation do not appear as displays within VCS.*

2. VCS Examples

When taken together, the tutorial examples describe how to exercise virtually all the capabilities of VCS. Beginning examples acquaint the new user with basic VCS operations. Subsequent examples build on these fundamentals in order to foster the user's progression to intermediate and advanced levels of expertise. (*Note, it is assumed that the advanced user can identify, access, and operate the VCS panels appropriate for each example without requiring much guidance.*)

For further information on panel features and operations, refer to the Hints chapter of this User's Guide. Before undertaking any example, however, read the VCS Setup Information.

How to Use the Examples

Selecting an Example:

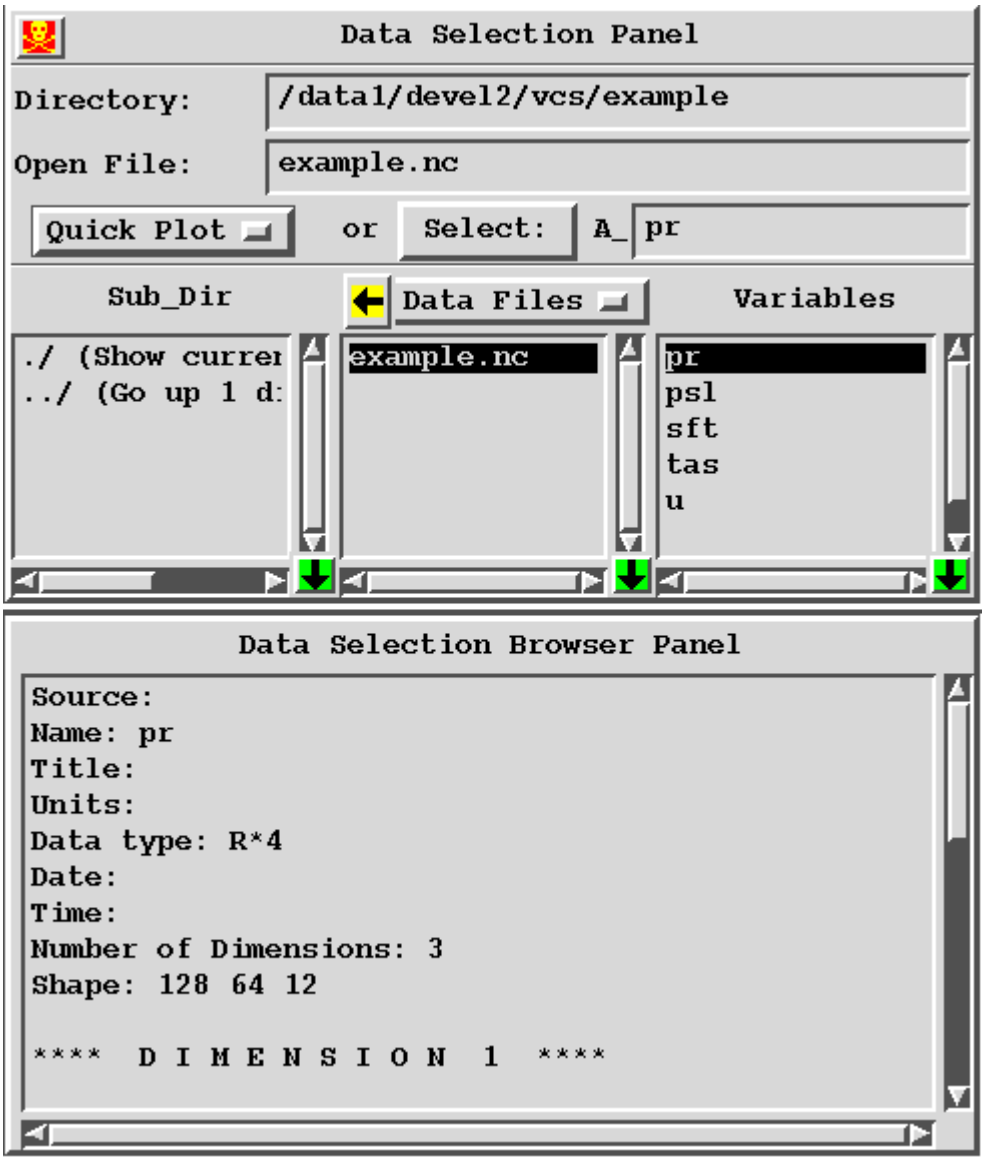
Move the pointer over the desired example, and click the left mouse button. The description of the example's purpose and procedure steps '1' through 'N' then will be displayed.

Following an Example:

Follow the example's specified procedure steps. It is recommended that a Network Common Data Format (netCDF) data file ***example.nc*** provided with the VCS software be used in conjunction with the examples in order to verify their correct execution. (The figures shown in the examples are generated from the ***example.nc*** data.) In principle,

however, any 3-dimensional data that are written in a format accessible by VCS may be substituted. Besides netCDF, acceptable formats include the Hierarchical Data Format (HDF), PCMDI's Data Retrieval and Storage (DRS) format, and the formats (including Gridded Binary or GRIB format) supported by the Grid Analysis and Display System (GrADS).

VCS Example: Selecting and Browsing Data



Description

This example acquaints the user with the Data Selection and Data Selection Browser Panels (see above figure). The Data Selection Panel is used for selecting data, while the Data Selection Browser Panel displays the attributes of a data variable, including dimension information.

Step 1: Accessing the Data Selection and Data Selection Browser Panels

Access the Data Selection and Data Selection Browser Panels if they are not already visible on the right side of the VCS Interface (via Main Menu:'File'-'Select Data').

Step 2: Changing the Directory

Change the directory to the location of the example netCDF file ***example.nc*** by moving the pointer over the 'Directory' input text window on the Data Selection Panel and clicking the left mouse button. Then type the name of the appropriate directory in the input text window, and press the 'Enter' (or 'Return) key on the keyboard. *(Note, VCS recognizes the C shell tilde ~ convention as designating the home directory.*) The directory also can be changed by moving the pointer over the 'Sub_Dir' scroll window and clicking the left mouse button on a desired subdirectory. The ***'example.nc'*** file now should be listed in the 'Data files' scroll window.

Step 3: Viewing All Files in the Directory

To view all files in the directory, move the pointer over the 'Data Files' menu button and press and hold the left mouse button. Then move the pointer over the 'All Files' menu item and release the left mouse button. All files in the directory will be shown in the scroll window directly below.

To view only data files ending with: '.nc' (netCDF extension), '.hdf' (HDF extension), '.dic' (DRS extension), and '.ctl' (GrADS extension) move the pointer over the 'All Files' menu button and press and hold the left mouse button. Then move the pointer over the 'Data Files' menu item and release the left mouse button.

Step 4: Viewing the Data Variables

Move the pointer over the ***example.nc*** file name and click the left mouse button. The file's data variables will be listed in the 'Variables' scroll window.

Step 5: Viewing the Variable's Attributes

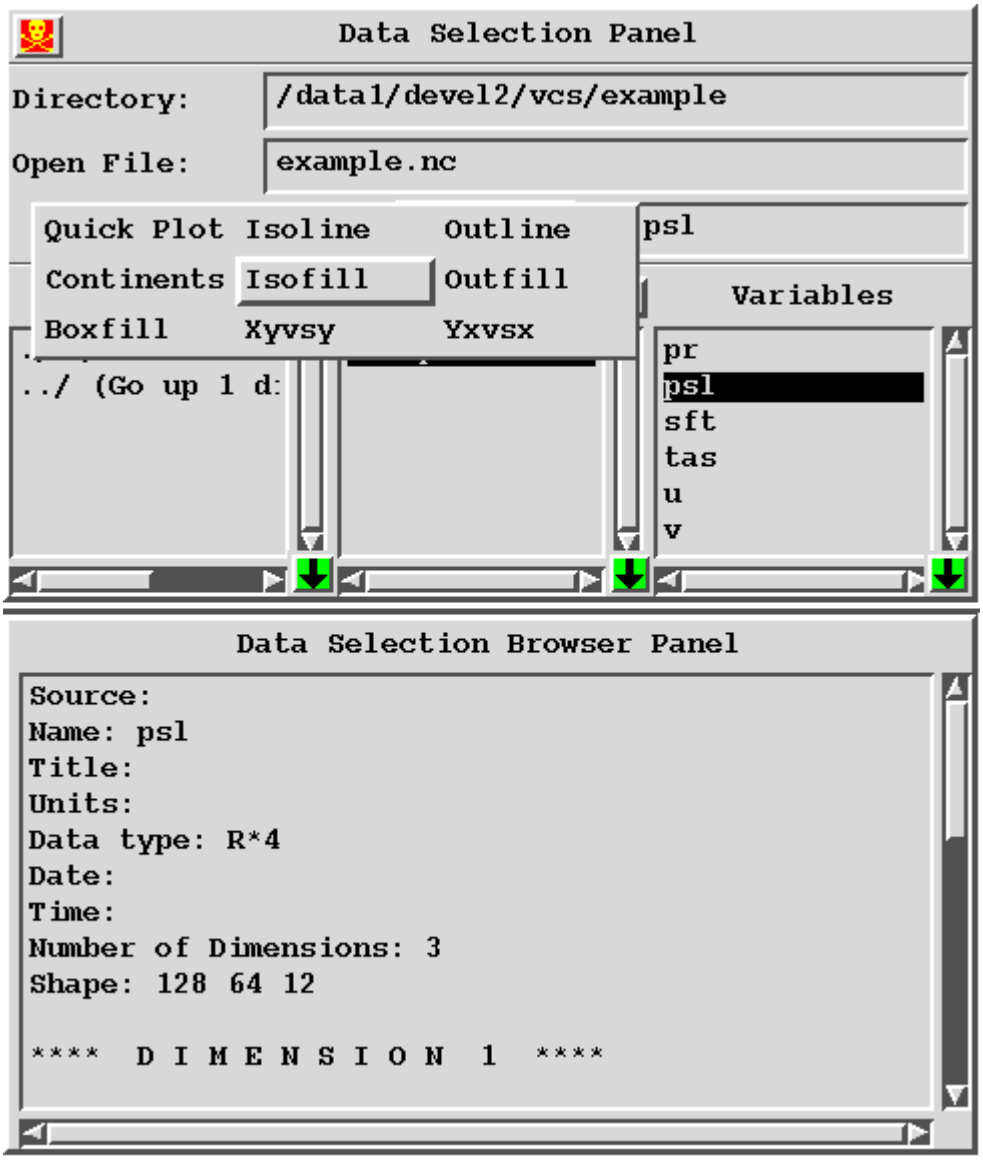
Move the pointer over a data variable name in the 'Variables' scroll window (e.g., 'pr' for precipitation) and click the left mouse button. The variable's attributes will be displayed in the Data Selection Browser Panel. Scroll down this window to view more of the variable's attributes.

Step 6: Enlarging the Data Selection Panel

Move the pointer over one of the green arrow buttons located at the bottom of the 'Sub_Dir', 'Data Files', and 'Variables' scroll windows (see above figure), and click the left mouse button--the scroll window will enlarge. Click again on the green arrow button to restore the scroll window to its former size.

See also the Hints on the Data Selection and Data Selection Browser Panels for more information.

VCS Example: Quick Plotting Data



Description

Quick plotting is a way to efficiently display data variables by using default settings of various graphics methods. This example is an extension of the Example on Selecting and Browsing Data. (Work through the latter Example before proceeding.)

Step 1: Specifying the Data

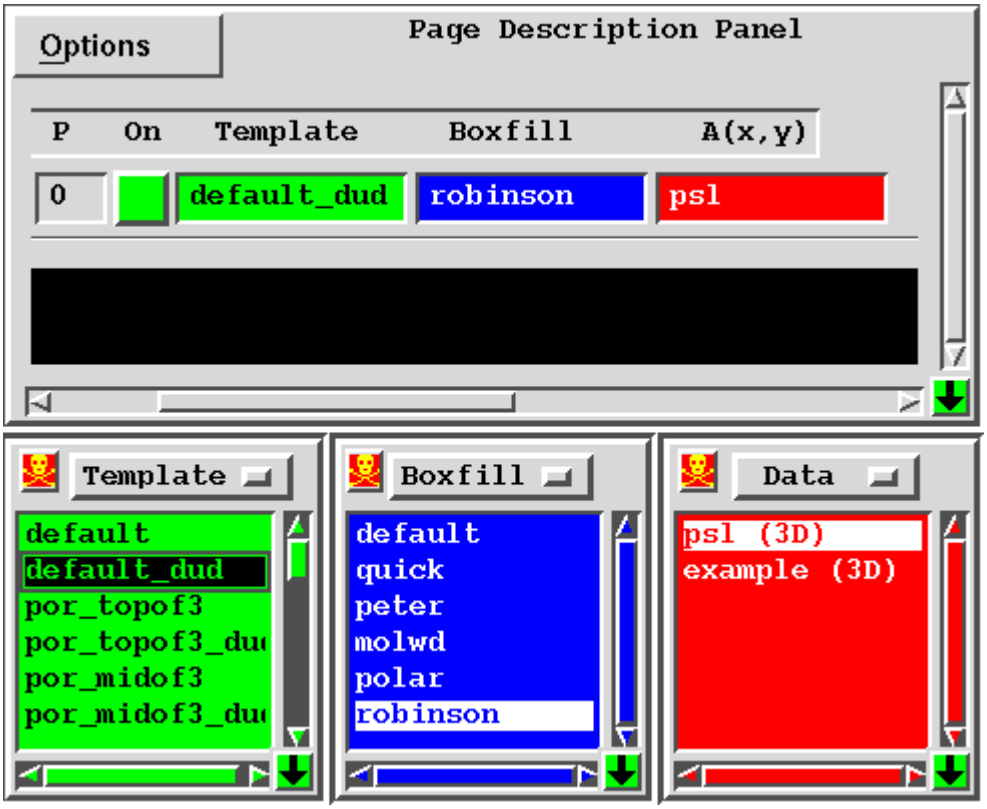
Move the pointer over the ***'example.nc'*** file in the Data Selection Panel (see above figure) and click the left mouse button. Then select 'psl' (i.e., sea-level pressure) in the 'Variables' scroll window. This variable's attributes will be displayed below in the Data Selection Browser Panel. (See Example on Selecting and Browsing Data, steps 1 through 4.)

Step 2: Viewing the Data

Move the pointer over the 'Quick Plot' menu button, and press and hold the left mouse button. An assortment of graphics methods will appear (see above figure). Then move the pointer over the 'Isofill' graphics method and release the left mouse button. A plot of the data variable will appear on the VCS Canvas at the left side of the Interface. *Note that the red Data Panel (above the Data Selection Browser Panel) has 'QuickPlot (3D)' listed and that a picture descriptor form (in the Page Description Panel at the top right of the VCS Interface) has been created with the 'default' template, the 'default' selected graphics method (i.e., 'Isofill') and the 'QuickPlot' data attribute set name assigned.*

Now perform **Step 2** again, this time choosing the 'Isoline' graphics method.

VCS Example: Creating Plots by Different Graphics Methods



Description

In the VCS model, the data display is defined by a trio of named attribute sets, designated the primary elements, which include the data, the graphics method and the picture template. The data defines what is to be displayed, the graphics methods specifies the display technique used to view the data, and the picture template determines the appearance of each segment of the display. This example acquaints the user with procedures for selecting attributes sets for the data , the graphics method, and the picture template in order to generate different kinds of plots (e.g., isofill, isoline, boxfill, etc.).

Step 1: Accessing the Data Selection and Data Selection Browser Panels

Access the Data Selection and Data Selection Browser Panels (via Main Menu: 'File'- 'Select Data') if they are not already visible on the right side of the VCS Interface.

Step 2: Selecting the Data File

Change the directory to the location of the example netCDF file ***'example.nc'*** (see the Example on Selecing and Browsing Data for procedure). Then move the pointer over the data file name ***'example.nc'*** and click the left mouse

button. The data variables will be displayed in the 'Variables' scroll window at the right side of the Data Selection Panel.

Step 3: Creating a Data Attribute Set

There are two ways (shown below) to create a data attribute set from the Data Selection Panel. Follow *Approach A* to create unique data attribute set names, and follow *Approach B* for quick entry into the Data Panel.

Approach A

In the Data Selection Panel, move the pointer over a variable name in the 'Variables' scroll window (e.g., 'psl' for sea-level pressure) and click the left mouse button. The selected data variable name will appear in the 'A_' input text window (located directly above the 'Variables' scroll window). Then move the pointer over the 'A_' input text window and click the left mouse button. Change the data attribute set name from 'psl' to 'example', and press the 'Select:' button to the left of the 'A_' input text window. The data attribute set name (i.e., 'example (3D)', where '(3D)' indicates the data's dimensionality) then will appear in the red Data Panel (located above the Data Selection Panel in the VCS Interface).(*Note, if the red Data Panel is not visible, then from the Main Menu select 'Primary'- 'Data Table'.)*

Approach B

Double-click the left mouse button on the desired data variable (e.g., 'psl' for sea-level pressure) in the 'Variables' scroll window of the Data Selection Panel. The data attribute set name (i.e., 'psl (3D)', where '(3D)' indicates the data's dimensionality) then will appear in the red Data Panel (located above the Data Selection Panel in the VCS Interface) *Note, the data attribute set names must be unique*. (If the red Data Panel is not visible in the VCS Interface, then access it via Main Menu select 'Primary'-'Data Table'.) If the selected name is not unique, an error will be indicated in the VCS Message Panel.

Step 4: Selecting a Graphics Method

Access the desired blue Graphics Method Panel (e.g., the 'Boxfill' graphics method is selected via Main Menu: 'Primary'- 'Graphics Table'- 'Boxfill'). The Graphics Method Panel will appear above the Data Selection Panel and to the left of the red Data Panel in the VCS Interface. (*Note, when VCS is initialized with the* ***initial.attributes*** *file, the 'Boxfill' Graphics Method Panel is automatically displayed in the VCS Interface.)*

Step 5: Viewing the Template Panel

Access the green Template Panel (via Main Menu: 'Primary'- 'Template Table'), which will appear above the Data Selection Panel and to the left of the blue Graphics Method Panel in the VCS Interface. (*Note, when VCS is initialized with the* ***initial.attributes*** ***file****, the Template Panel is automatically displayed in the VCS Interface.)*

Step 6: Viewing/Creating the Picture Descriptor Form

In the scroll window area of the Page Description Panel (located in the upper right corner of the VCS Interface), there is a picture descriptor form (see above figure) which contains three input text windows standing for the primary elements: template (in green), graphics method (in blue), and data (in red). The attribute set names for these elements are displayed in the respective input text windows of the picture descriptor form. (*Note, if a picture descriptor form is not already visible on the VCS Interface or if creation of another form is desired, move the pointer over the 'Options' menu button on the Picture Description Panel and press and hold the left mouse button. Then move the pointer over the 'Picture' menu item while continuing to hold down the left mouse button. Next, move the pointer over 'Create' pull right menu item and release the left mouse button. This action will cause a new picture descriptor form to appear with 'default' attribute set names for the template and the 'Boxfill' graphics method.)*

Step 7: Plotting the Data Attribute Set

Move the pointer over the desired data attribute set name in the red Data Panel (e.g., 'example (3D)') and click the *middle* mouse button. This action copies the data attribute set name into the VCS copy buffer, with this event being registered in the Message Panel. Then move the pointer to the desired picture descriptor form's red data

input text window and again click the *middle* mouse button. This action drops the data attribute set name (i.e., 'example(3D)') into the picture descriptor form's red data text input window. A boxfill image then will appear on the VCS Canvas, and the page descriptor form's status button will change from red (indicating incomplete form or error) to green (indicating a complete form with the picture displayed on the VCS Canvas).

Step 8: Toggling the Plot On/Off

Toggle the green ('On') status button in the picture descriptor form to yellow ('Off') by moving the pointer over the green button and clicking the left mouse button. The image on the VCS Canvas will disappear. Then toggle the yellow ('Off') status button in the picture descriptor form to green ('On') by moving the pointer over the yellow button and again clicking the left mouse button. The picture will be replotted on the VCS Canvas.

Step 9: Changing the Template Attribute Set

Move the pointer over a desired template attribute set name in the green Template Panel (e.g., 'default_dud') and click the *middle* mouse button. This action copies the template attribute set into the VCS copy buffer, with this event being registered in the Message Panel. Then move the pointer to the desired picture descriptor form's green template input text window and again click the *middle* mouse button. This action drops the template attribute set name (i.e., 'default_dud') into the picture descriptor form's green template input text window. If the status of the picture descriptor form is 'On', then the display change will be immediately visible on the VCS Canvas.

Step 10: Changing the Boxfill Attribute Set

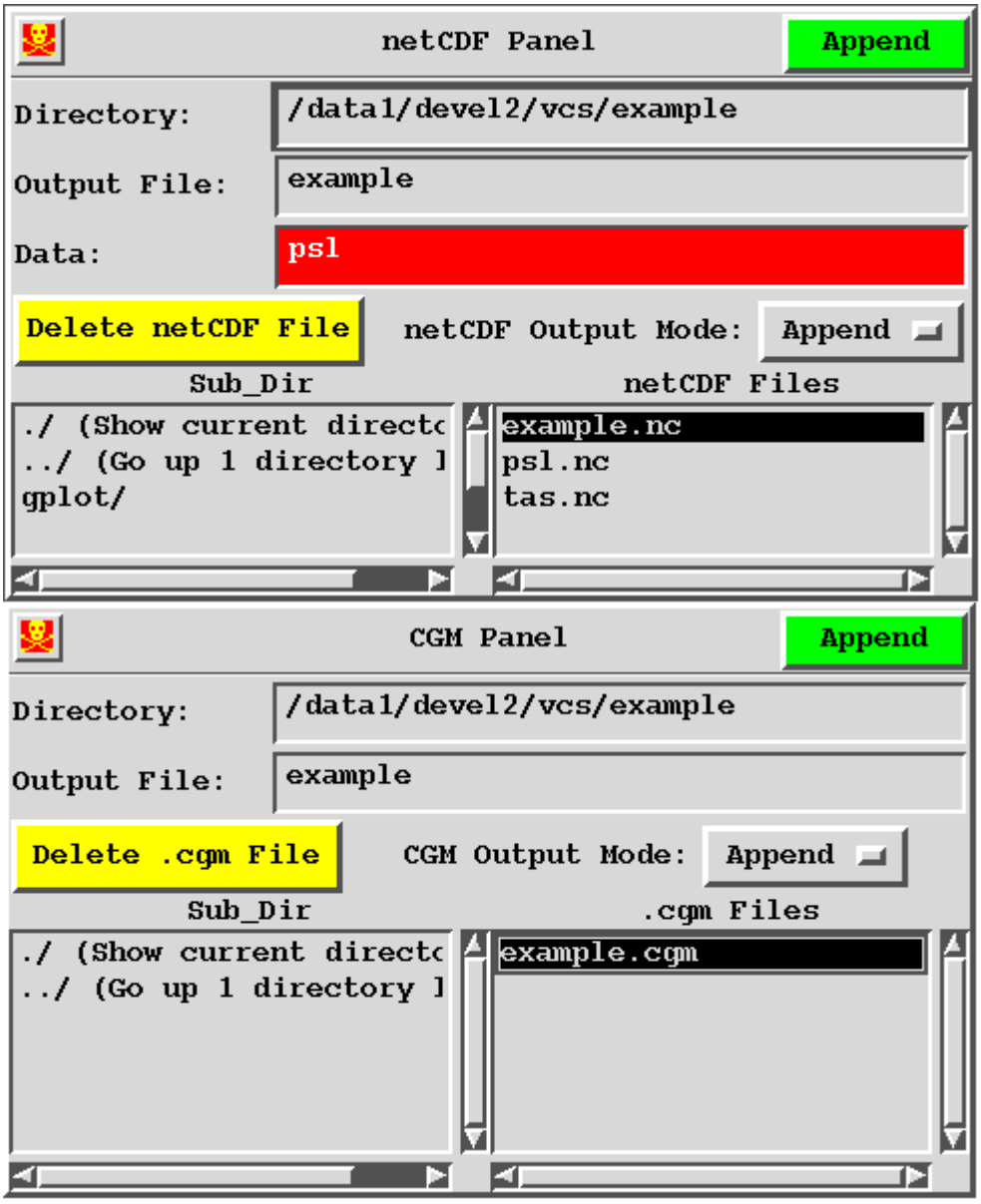
Move the pointer over a desired Boxfill attribute set name in the blue Boxfill Graphics Method Panel (e.g., 'robinson' for a boxfill method using the Robinson map projection) and click the *middle* mouse button. This action copies the 'Boxfill' attribute set into the VCS copy buffer, with this event being registered in the Message Panel. Then move the pointer to the desired picture descriptor form's blue graphics method input text window and again click the *middle* mouse button. This action drops the graphics method attribute set name (i.e,, 'robinson') into the picture descriptor form's blue graphics method input text window. If the status of the picture descriptor form is 'On', then the display change will be immediately visible on the VCS Canvas.

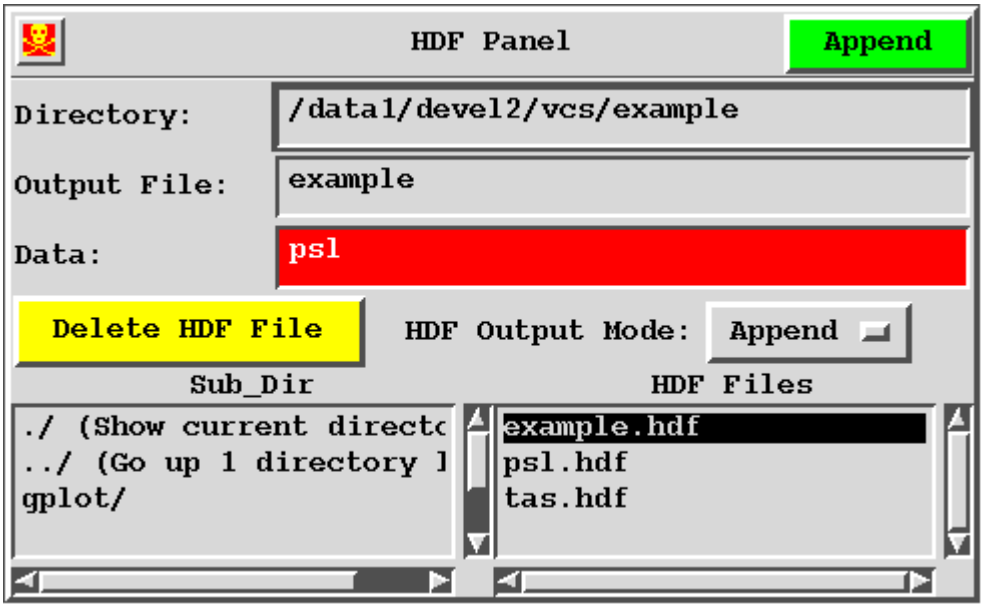
Step 11: Changing the Graphics Method

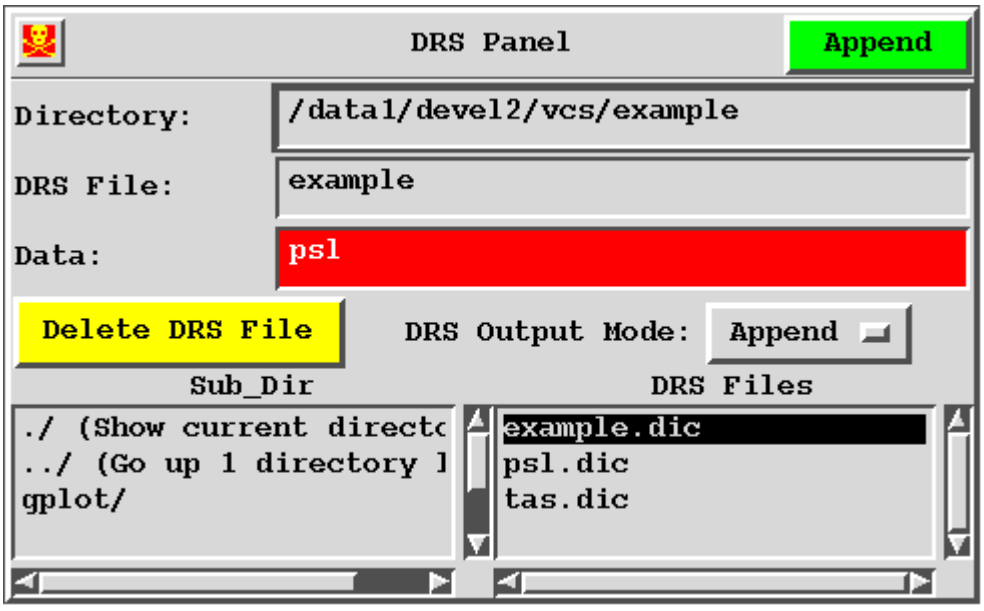
Display the data using other graphics methods (by selecting via Main Menu: 'Primary' - 'Graphics Table' - 'Continents', or 'Isofill', or 'Isoline', or 'Outfill', or 'Outline', or 'Scatter', or 'Vector', or 'XvsY', or 'Xyvsy', or 'Yxvsx'). The selected Graphics Method Panel will replace the one currently being displayed. Repeat **Step 10** (and other appropriate steps) to display data using the specified graphics method. *Note, some graphics methods (e.g., 'Vector' and 'Scatter') require two data attribute sets . In that case, scroll the Page Description Panel to the left to view the second red data entry input text window, and repeat **Step 3** and **Step 7**.*

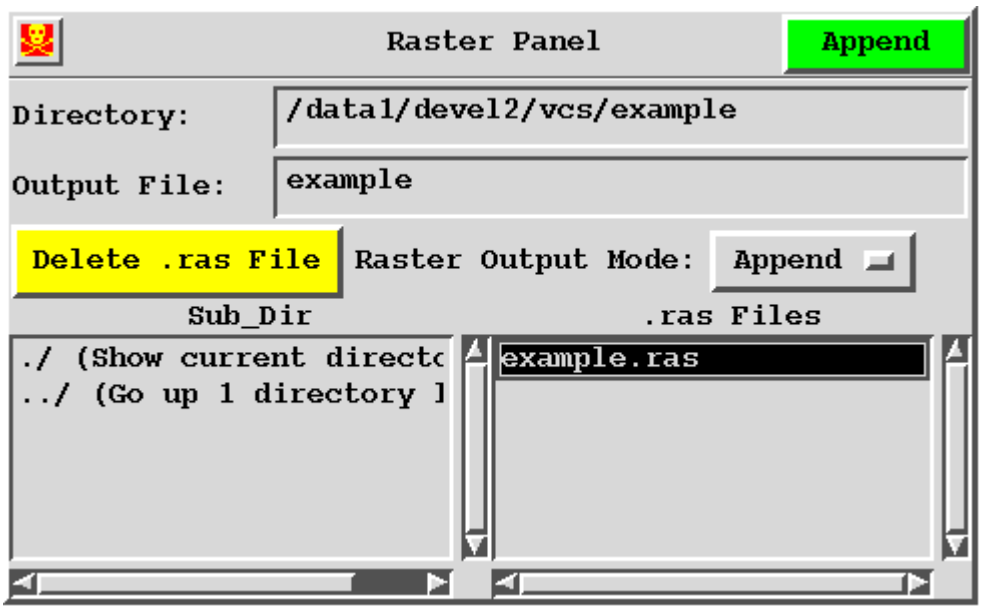
See also Hints on the Page Description Panel, on the Data Selection and Data Selection Browser Panels, and on the Data, Graphics Method, and Template Panels for further information.

VCS Example: Saving CGM, netCDF, HDF, DRS, and Raster Files




HDF Panel
Append
Directory:
/data1/devel2/vcs/example
Output File:
example
Data:
psl
Delete HDF File
HDF Output Mode:
Append
Sub_Dir
HDF Files
./ (Show current directc
../ (Go up 1 directory l
gplot/
example.hdf
psl.hdf
tas.hdf


DRS Panel
Append
Directory:
/data1/devel2/vcs/example
DRS File:
example
Data:
psl
Delete DRS File
DRS Output Mode:
Append
Sub_Dir
DRS Files
./ (Show current directc
../ (Go up 1 directory l
gplot/
example.dic
psl.dic
tas.dic



Description

VCS has the ability to save a display as a file in Computer Graphics Metafile (CGM) or raster format. Data attributes sets can be saved in: the Network Common Data Form (netCDF) format; the Hierarchical Data Format (HDF) format; and the PCMDI Data Retrieval and Storage (DRS) format. This example shows how to create CGM (with extension '.cgm'), raster (with extension 'ras'), netCDF files (with extension '.nc'), HDF files (with extension '.hdf'), or DRS files (with extension '.dic' for dictionary, containing metadata). *Note, CGM files also can be converted into Postscript--see the Example on Printing CGM Files.* VCS creates Sun raster files that can be converted to other raster formats with the aid of imaging tools such as IMCONV (available from the San Diego Supercomputer Center). A netCDF, HDF, or DRS file can be converted to other file formats via the Data and Dimensions Interface (DDI).

Step 1: Displaying Data on the VCS Canvas

To create a CGM or raster file, a plot must be visible on the VCS Canvas. (See the Example on Quick Plotting Data or the Example on Creating Plots by Different Graphics Methods).

Step 2: Viewing the CGM, Raster, netCDF, HDF, and DRS Panels

Access the desired CGM, Raster, netCDF, HDF, or DRS Panel (via Main Menu: 'File'- 'Save CGM'; 'File'- 'Save Raster'; 'File' - 'Save netCDF'; 'File' - 'Save HDF'; or 'File' - 'Save DRS').

Step 3: Changing the Directory

Change to the directory where the file is to be save by moving the pointer over the 'Directory' input text window (see above figures) and clicking the left mouse button. Then enter the appropriate directory name press the 'Enter' (or 'Return) key on the keyboard--the 'Sub_Dir' scroll window will change accordingly. (*Note, the the C shell tilde '~ ' designation for the home directory is recognized by VCS.*) The directory also can be changed by moving the pointer over the desired subdirectory in the 'Sub_Dir' scroll window and clicking the left mouse button.

Step 4: Entering the Output File Name

Enter the chosen name for the CGM, Raster, netCDF, HDF, or DRS output file in the 'Output File' text window (see above figures). This is done by moving the pointer over the 'Output File' text window, clicking the left mouse button, and typing the desired output file name (e.g., **'example'**) in the text window.

If there are files listed in the '.cgm Files', '.ras Files', 'netCDF Files', 'HDF Files', or 'DRS Files' scroll window on

the CGM, Raster, netCDF, HDF, or DRS Panels, respectively (see above figures) and a file is to be reused, then select the file name. This action will cause the selected file name to be displayed in the 'Output File' text window.

Step 5: Entering the Data Attribute Set Name

(*Note, this step is only required when using the netCDF Panel, HDF Panel, or DRS Panel.)*

Move the pointer over the desired attribute set name in the red Data Panel (e.g., **'psl (3D)'**) and click the *middle* mouse button. This action will copy the data attribute set name into the VCS copy buffer and will register the event in the Message Panel. Then move the pointer to the netCDF Panel's, HDF Panel's, or DRS Panel's red data input text window and click the *middle* mouse button again. This action will copy the data attribute set name (i.e., **'psl'**) into the text input window.

Step 6: Changing the Output Mode

If desired, change the 'Output Mode' menu button to either 'Append' (the default setting) or 'Replace'. 'Append' mode adds the output to an existing file, while 'Replace' mode overwrites an existing file with new output.

Step 7: Saving the Output File

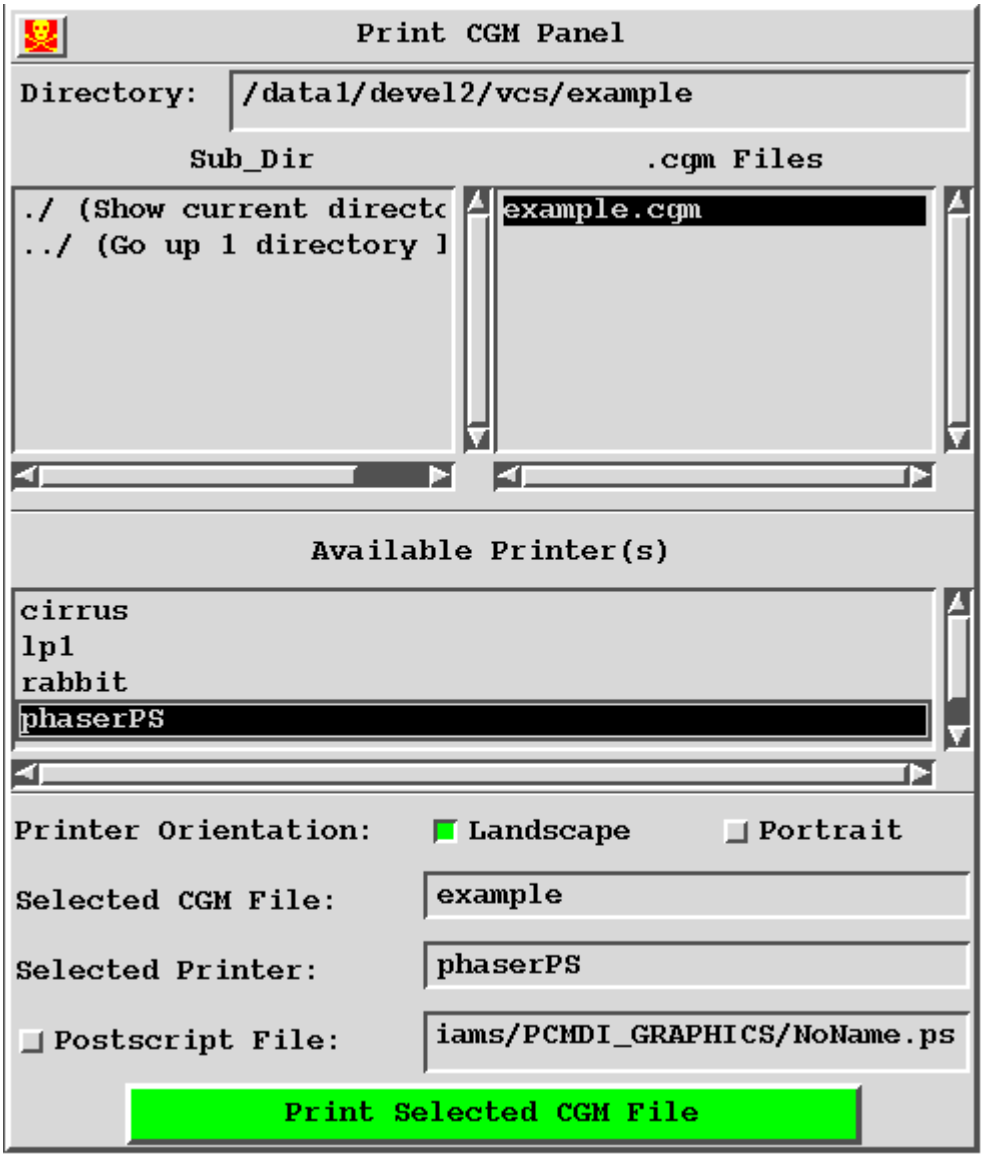
Depending on the desired 'Output Mode', select the green 'Append' or the 'Replace' button. This action will save the output to a file and cause the CGM, Raster, netCDF, HDF, or DRS Panel to disappear.

Step 8: Deleting an Output File

To delete a CGM, raster, netCDF, HDF, or DRS file, move the pointer over the file name in the output file scroll window and click the left mouse button . Then select the yellow 'Delete File' button on the chosen panel (see above figures) with the left mouse button--a popup window will appear. Move the pointer over the 'Delete' button and click the left mouse button--file deletion will be confirmed in the popup window.

See also Hints on the CGM Panel, on the Raster Panel, netCDF Panel, HDF Panel, and on the DRS Panel.

VCS Example: Printing CGM files



Description

VCS has the ability to convert a CGM file to a Postscript file for printing. This example shows how to make this conversion.(The Example on Saving CGM, netCDF, HDF, DRS, and Raster Files explains how to generate CGM output files.)

Step 1: Preparing the HARD_COPY file

Ensure that the HARD_COPY file contains the necessary information concerning the Postscript printer(s) at the user's home site, and that this file is situated in subdirectory

/$HOME/PCMDI_GRAPHICS/HARD_COPY

where ***/$HOME*** designates the user's home directory (see VCS Setup Information).

Step 2: Generating a CGM Output File

Generate a CGM file by following the procedures set out in the Example on Saving CGM, netCDF, HDF, DRS, and Raster Files.

Step 3: Accessing the Print CGM Panel

Access the Print CGM Panel (via Main Menu: 'File'- 'Print CGM') if it is not already visible on the right side of the VCS Interface.

Step 4: Changing the Directory

Change the directory to the location of the CGM file. This is done by moving the pointer over the 'Directory' input text window (see above figure) and clicking the left mouse button. Then enter the appropriate directory name in the input text window, and press the 'Enter' (or 'Return) key on the keyboard. The 'Sub_Dir' scroll window will change accordingly. (*Note, VCS recognizes the C shell tilde '~' convention for home directories.*)

The directory also can be changed by moving the pointer over the desired subdirectory in the 'Sub_Dir' scroll window and clicking the left mouse button.

Step 5: Selecting the CGM File

Select a CGM file by moving the pointer over the desired CGM file name in the '.cgm Files' scroll window (e.g., ***example.cgm***) and clicking the left mouse button. The 'Selected CGM file' input text window (located at the bottom of the Print CGM Panel) will display the chosen file name.

Step 6: Selecting an Output Printer

To select an output printer, move the pointer over the desired print device name in the 'Available Printer(s)' scroll window and click the left mouse button. The 'Selected Printer:' input text window (located at the bottom of the Print CGM Panel) will display the chosen printing device. (*Note, the **HARD_COPY file** lists the available printers at the user's home site.)*

Step 7: Selecting the Printer Orientation

Select 'Landscape' or 'Portrait' orientation by use of the 'Printer Orientation:' toggle switch on the Print CGM Panel. If the cgm file was saved while the VCS Canvas was in 'Landscape' mode, then select the 'Landscape' toggle button. Select the 'Portrait' toggle bottom if the converse applies.

Step 8: Saving to a Postscript File

To save the CGM file to a Postscript file, move the pointer over the 'Postscript File' input text window and click the left mouse button. Then enter the appropriate directory and Postscript file name in the input text window. *Note, if a directory and file name are not specified, VCS will create a default Postscript file 'NoName.ps' in directory*

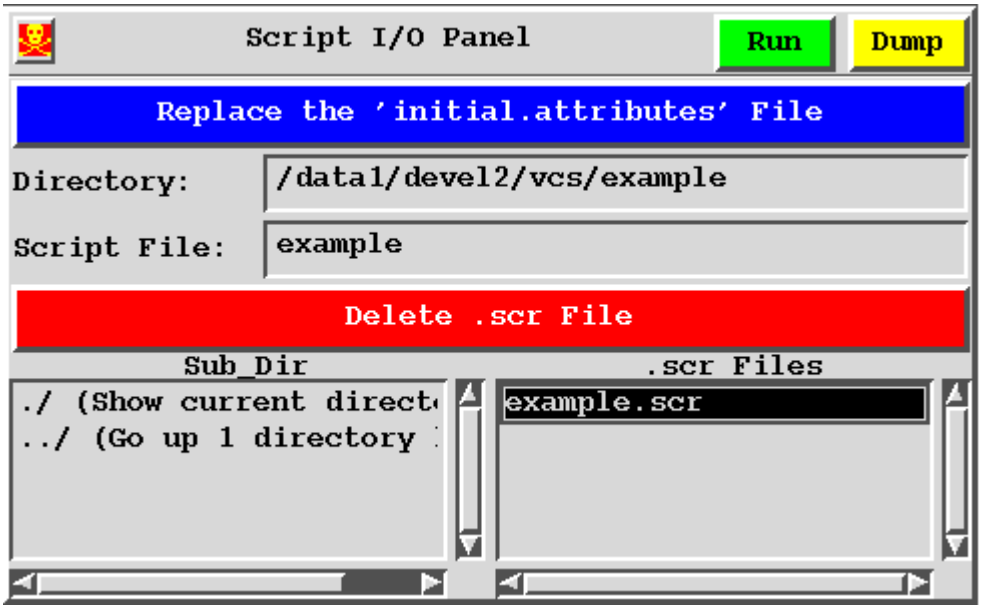
/$HOME/PCMDI_GRAPHICS

Step 9: Sending CGM Output to a Designated Postscript Printer/ File

To send the CGM files to a designated Postscript printer or file, select the green 'Print Selected CGM File' button on the Print CGM Panel.

See also Hints on the Print CGM Panel and the information provided in the HARD_COPY file that is included with the VCS software.

VCS Example: Saving and Running Scripts



Description

The VCS scripting capability serves many purposes. It allows one to save the system state for replay in a later session; to save primary and secondary element attributes for use in later visual presentations; to save a sequence of interactive operations for replay; or to recover from a system failure. This example shows how to save the state of the system and how to replay it in a later session.

Step 1: Displaying Data on the VCS Canvas

Generate a plot visible on the VCS Canvas. (See the Example on Quick Plotting Data or the Example on Creating Plots by Different Graphics Methods).

Step 2: Accessing the Script I/O Panel

If it is not visible on the right side of the VCS Interface, access the Script I/O Panel (see above figure) via Main Menu: 'File- 'Script I/O'.

Step 3: Changing the Directory

Change the directory to the desired location for the output script file. This is done by moving the pointer over the 'Directory' text window and clicking the left mouse button, then entering the directory name and pressing the 'Enter' (or 'Return) key on the keyboard. The 'Sub_Dir' scroll window will change accordingly. (*Note, VCS recognizes the C shell tilde (~) convention for home directories when entries are made in the text window.*)

The directory also can be changed by moving the pointer over the 'Sub_Dir' scroll window and clicking the left mouse button on the desired subdirectory.

Step 4: Entering the Script File Name

Move the pointer over the 'Script File' input text window and click the left mouse button. Then enter the desired script output file name (e.g., ***'example'***) in the 'Script File' text window. To replace a script file or to select one for replay, move the pointer over the desired script file name in the '.scr Files' scroll window and click the left mouse button. The 'Script File' text window then will display the selected script file name. When replacing an old (backup) script file, look for the '%' appended to the script file name in the same directory.

Step 5: Saving a Script File

To save a script file, move the pointer over the yellow 'Dump' button at the top right of the Script I/O Panel and

click the left mouse button. This action will save the script output to a file (e.g., ***'example.scr'***) and will cause theScript I/O Panel to disappear.

Step 6: Running a Script File

To run a script file, move the pointer over the green 'Run' button at the top right of the Script I/O Panel and click the left mouse button. This action will recreate the state of the system when the script file was saved and also will cause the Script I/O Panel to disappear.

See also Hints on the Script I/O Panel.

VCS Example: Running in Noninteractive Modes

Description

VCS can be controlled interactively or from a script file, and control also can alternate between these modes during a session. This example demonstrates how to run VCS in various noninteractive modes.

Step 1: Running a Script in Batch Mode

A script file can be read in the absence of the VCS Interface. To do so, run VCS with the '-i' or '-ni' option, e.g. enter

vcs -i *path/inputscriptfilename.scr*

During the reading of this script file, the process is in a batch-like mode and only the VCS Canvas may appear displaying plots; after completion of the script, the Canvas will disappear. Once the script file has been read, control will become interactive; any graphics that were displayed will be erased and then redisplayed on the VCS Canvas for the interactive portion of the session. Other script files also can be selected for input (see the Example on Saving and Running Scripts).

or, alternatively, enter

vcs -ni *path/inputscriptfilename.scr*

During the reading of this script file, the process is in a batch-like mode and only the VCS Canvas may appear displaying plots; after completion of the script, the Canvas will disappear and VCS will terminate.

As an exercise, work through the Example on Saving and Running Scripts to create a script file. Then run the script in batch mode with the '-i' and '-ni' option.

Step 2: Running a Continuous Script

A continuous script can be saved during an interactive session by specifying the '-o' option and an output file on the command line:

vcs -o *path/outputscriptfilename.scr*

The replay of the output script file will not reproduce the manipulations of buttons and menus that are seen during the interactive session, but it will reproduce the graphic displays and changes to the tables and their attributes sets. It will also save the same CGM file(s) and raster images(s).

As an exercise, run VCS with the '-o' options and work through the Example on Selecting and Browsing Data or the Example on Quick Plotting Data. Then exit VCS and repeat **Step 1** above.

Step 3: Exiting VCS

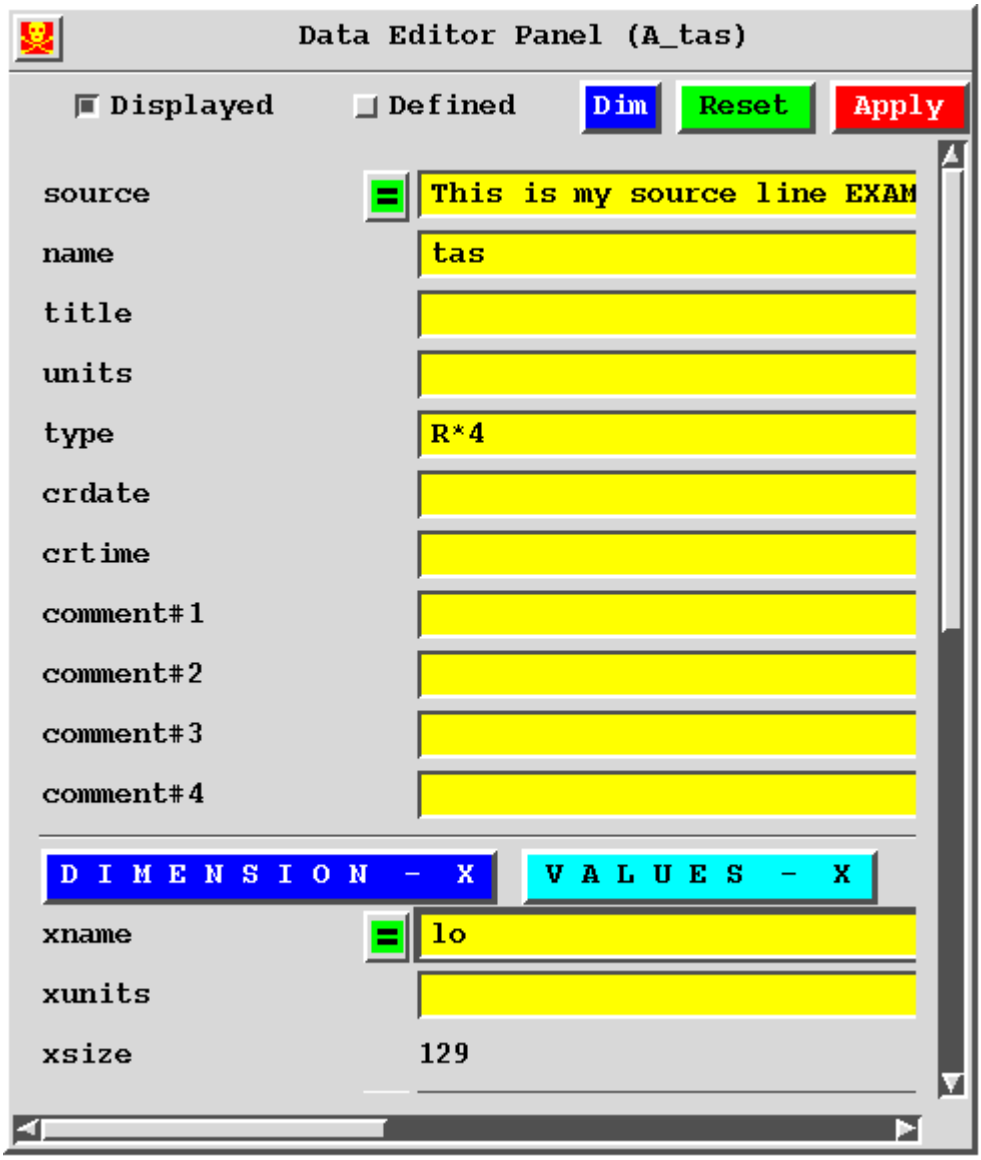
When exiting VCS, a file is automatically created with path

/$HOME/PCMDI_GRAPHICS/final.scr

where */$HOME* designates the user's home directory. The <I.final.scrfile then can be used to recreate this final state of the system in a future VCS session.

As an exercise, work through the Example on Selecting and Browsing Data or the Example on Quick Plotting Data, and exit VCS. Then recover the final state of this session by running the ***final.scr*** file.

VCS Example: Modifying Data



Description

In VCS, array data attribute sets and their associated dimensions can be modified. This example shows how to accomplish these tasks by use of the Data Editor Panel and the Dimension Manipulation Panel.

Step 1: Specifying the Template, Boxfill Graphics Method, and Data

If the green Template Panel is not visible on the VCS Interface, then access it (via Main Menu: 'Primary' - 'Template Table'). If the blue 'Boxfill' Graphics Method Panel is not visible, then access it (via Main Menu: 'Primary' - 'Graphics Table' - 'Boxfill'). If the red Data Panel is not visible, then access it (via Main Menu: 'Primary' - 'Data Table'). Finally, if the Data Selection and Data Selection Browser Panels are not visible, access them (via Main Menu: 'File' - 'Select Data').

Then copy the 'default' attribute sets for the template and 'Boxfill' graphics method to the green and blue text panels, respectively, on the chosen picture descriptor form. (See the Example on Creating Plots by Different Graphics Methods for procedures.)

Next, move the pointer over the ***example.nc*** file name in the Data Selection Panel's 'Data Files' scroll window and click the left mouse button. Then move the pointer over the 'tas' variable in the 'Variables' scroll window and double-click the left mouse button. The data attribute name 'tas (3D)' will appear in the red Data Panel above.

To display the data, move the pointer over the 'tas (3D)' name in the Data Panel and click the *middle* mouse button. Then move the pointer to the red text window in the chosen picture descriptor form and click the *middle* mouse button again. This action will plot the 'tas (3D)' data with the 'default' Template and 'default' 'Boxfill' graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods).

Step 2: Accessing the Data Editor Panel

Move the pointer over the displayed data attribute set name (i.e., 'tas (3D)') in the red Data Panel and click the left mouse button. The Data Editor Panel '(A_tas)' will appear below (see above figure). See also Hints on the Data Editor Panel.

Step 3: Viewing the Displayed and Defined Array Data Attribute Sets

The Data Editor Panel lists a 'Displayed' and a 'Defined' array data attributes set. The 'Displayed' attribute set represents what will be displayed on the VCS Canvas, while the 'Defined' attribute set specifies the properties of the data variable.

Move the pointer over the 'Defined' toggle button (at the top of the Data Editor Panel) and click the left mouse button--the defined data attribute set will be shown. Then move the pointer over the 'Displayed' toggle button (at the top of the Data Editor Panel) and click the left mouse button--the displayed data attribute set will be shown.

Step 4: Editing the Displayed Array Data Attribute Set

Edit the yellow 'source' input text window on the Data Editor Panel by moving the pointer over the yellow text window, clicking the left mouse button, and entering the string ***'This is my source line EXAMPLE!'***. If there is text already displayed, move the pointer over the yellow text window and click the left mouse button quickly three times--this action will highlight the entire line. Then type the text (e.g., ***'This is my source line EXAMPLE!'***) in the yellow text window.

When modifying a yellow text window on the Data Editor Panel, the 'Reset' and 'Apply' buttons will appear on the upper right corner and a green equal sign ('=') also will appear to the left of the text window. Select the red 'Apply' button to view the new 'source' string displayed on the upper left corner of the VCS Canvas.)

Step 5: Resetting the Modified Attribute String

Select the green equal sign ('=') to the right of the yellow 'source' input text window in the Data Editor Panel. The message '********Apply to see New String********' will appear in the yellow input text window. Next, select the red 'Apply' button to view the original contents of the line redisplayed in the yellow text window and on the VCS Canvas.

Step 6: Displaying the Continental Outlines

If 'longitude' appears in the yellow 'xname' text window on the Data Editor Panel and 'latitude' appears in the yellow 'yname' text window, then continental outlines will automatically be displayed on the plot. Modify the yellow 'xname' input text window from 'longitude' to 'lo'. Then select the red 'Apply' button. To view the change, move the pointer over the appropriate picture description form's green 'On' status button and and double-click the left mouse button. This action will remove the plot, then redraw it without continental outlines.

Step 7: Accessing the Dimension Manipulation Panel

Access the Dimension Manipulation Panel (see above figure) by moving the pointer over any of the blue buttons (i.e., 'Dim', 'DIMENSION - X' DIMENSION - Y', etc.) and clicking the left mouse button. See also Hints on the

Dimension Manipulation Panel.

Step 8: Unwrapping and Selecting a Subregion via the Dimension Scroll Window

The Dimension Manipulation Panel displays a column for each dimension that is defined in the array data attribute set (i.e., 'X', 'Y', 'Z', etc.).

The 'tas (3D)' original 'X- longitude' coordinate node values ranged from 0 to 357.187, but VCS has wrapped longitude in the negative direction and has selected coordinate node values ranging from -180 to 180 degrees. Unwrap the dimension by moving the pointer over the 'Wrap Top' down arrow button and clicking the left mouse button. The first coordinate node value then should be '0'.

Each column of the Dimension Manipulation Panel contains a scroll list of coordinate values, where selected values are highlighted. Move the pointer over the fifth selected value (i.e., over '11.25') in the 'X' scroll window and press and click the left mouse button. Move the pointer down 25 lines (i.e., over '67.5') and click the *middle* mouse button--a subset of the coordinate values is now specified. Then select the red 'Apply' button (located in the Dimension Manipulation Panel's upper right corner) to view changes.

Next, move the pointer over an unselected coordinate value (e.g., over '8.4375') and click the *right* mouse button--the coordinate value will be hightlighted. Then move the pointer over a selected coordinate value (e.g., over '64.6875') and click the *right* mouse button again--the coordinate value will be deleted. Select the red 'Apply' button (located in the upper right corner of the Dimension Manipulation Panel to view changes.

Step 9: Reversing a Dimension Coordinate

Reverse the direction of the dimensions by moving the pointer over the 'Reverse' button located in each column's control area and clicking the left mouse button. Then select the red 'Apply' button (located in the Dimension Manipulation Panel's upper right corner) to view changes.

Step 10: Striding a Dimension Coordinate

Stride the 'Y' dimension coordinate by moving the pointer into the Dimension Manipulation Panel's 'Stride' text window and clicking the left mouse button. Change the value of the 'Stride' input text window from '1' to '3', then press the 'Enter' (or 'Return') key on the keyboard. Next, select the red 'Apply' button (located in the Dimension Manipulation Panel's upper right corner) to view changes. (*Note, the up/down-arrows to the right of the 'Stride' text window can also be used to set the desired stride value.*)

Step 11: Transposing Dimensions

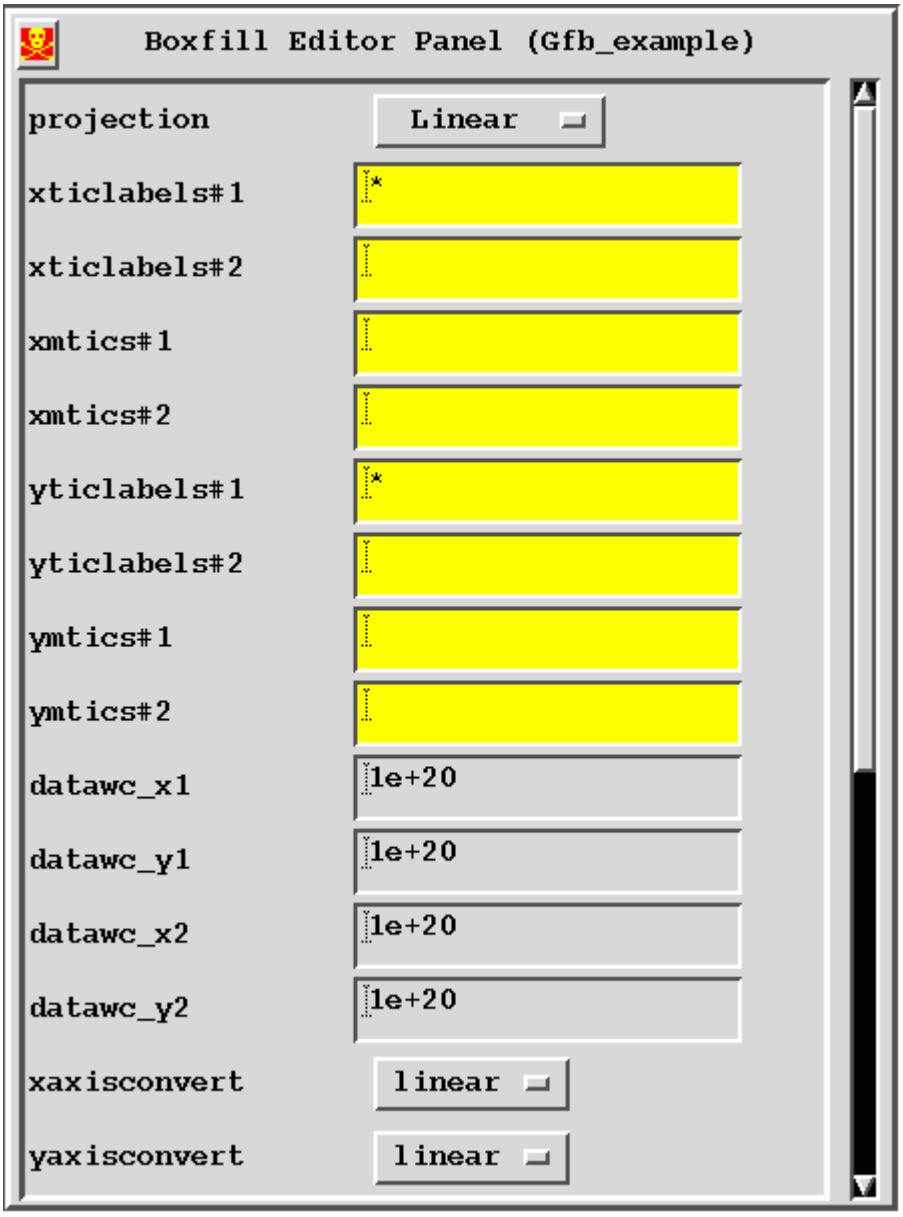
Transpose the 'X' and 'Y' dimensions by moving the pointer over the 'latitude' dimension button, located at the top of each column's control area and clicking the left mouse button. A scroll window displaying all the dimension names will appear. Move the pointer over the desired 'X' dimension name and click the left mouse button--the 'X' and 'Y' dimension will be transposed. Then select the red 'Apply' button (located in the Dimension Manipulation Panel's upper right corner) to view changes.

Step 12: Viewing Additional Dimensions

If the data attribute set has 3 or more dimensions, there will be at least one 'Scroll Dimension' arrow button located at the bottom of the Data Manipulation Panel. Select this arrow button to view additional hidden dimensions.

See also Hints on the Data Editor Panel and on the Dimension Manipulation Panel for further details.

VCS Example: Modifying Common Graphics Method Attributes



Description

Many different graphics methods are available in VCS (e.g., Boxfill,Isofill, Isoline, Outfill, Scatter, Vector, etc.). By using the appropriate editor panel, each graphics method can be modified to meet specific user needs. This example shows how to modify only the first 15 attributes that are *common* to all the graphics methods; modification of other attributes will be illustrated by subsequent examples. *Note, in the present example the Boxfill graphics method is used for purposes of illustration.*

Step 1: Modifying the Boxfill Attribute Set

Access the blue Boxfill Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - Boxfill). *Note, because VCS does not allow the modification of any 'default' attribute sets, another name must be assigned.* Therefore, move the pointer over the Boxfill 'default' attribute set name and click the *middle* mouse button. Next,

move the pointer over the Boxfill menu button and press and hold the left mouse button. Then move the pointer over the 'Copy' item and release the left mouse button--a popup window will appear. Enter a new Boxfill attribute set name (e.g., 'example') and select the 'Save' button. This is the new Boxfill attribute set that will be modified in this example.

Use this newly created Boxfill attribute set name and the Template 'default' attribute set name in the chosen picture descriptor form. Also use the variable 'tas' in the example netCDF data file ***example.nc*** for display by the Boxfill graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods).

Step 2: Accessing the Boxfill Editor Panel

In the blue Boxfill Graphics Method Panel, scroll the window down until the 'example' string is visible. Then select 'example' with the left mouse button. (If 'example' is selected with the *middle* mouse button, VCS will copy 'example' into its copy buffer; if 'example is selected with the *right* mouse button, VCS will delete 'example' from the list.) The Boxfill Editor Panel (see above figure) will appear below. Scroll this panel to the bottom.

Step 3: Changing the Map Projection

Change the map projection by moving the pointer over the 'projection' menu button in the Boxfill Editor Panel and pressing and holding the left mouse button. Then move the pointer over the desired map projection (e.g., 'Mollweide') and release the left mouse button. Select the red 'Apply' button to register changes. Then restore the map projection to 'Linear'.

*Note, the **placement** of segments such as the labels and tick marks is not addressed in this example. These attributes are changed by means of the Template Panel--see the Example on Modifying a Template. Note also, use of the spherical projections requires that the data be on a 'longitude' by 'latitude' grid--i.e., in the Data Editor Panel 'xname' must be 'longitude' and 'yname' must be 'latitude'. Moreover, when using the 'Polar' projection, to center the map about the opposite pole it is necessary to exchange the 'yfirst' and 'ylast' values by use of the Data Editor Panel--see the Example on Modifying Data.*

Step 4: Setting a List Name for Labels and Tick Marks

Remove the asterisk '' from the 'xticlabels#1' input text window (see* above figure). Then select the red 'Apply' button to register these changes. The x-axis labels and tick marks will be removed.

Next, access the List Table Panel (via Main Menu: 'Basic' - 'List Table'). *Note, because VCS does not allow the modification of the List 'lon30' and 'lat20' default attribute sets, these must be assigned new names.* Therefore, select the List 'lon30' attribute set name with the *middle* mouse button. Then move the pointer over the List menu button, press and hold the left mouse button, choose menu item 'Copy' and release the left mouse button--a popup window will appear. Enter a new List attribute set name here (e.g., 'example') and select the 'Save' button. This is the new List attribute set that will be modified.

To do so, copy and drop the List 'example' attribute set name into the 'xticlabels#1' input text window, and select the red 'Apply' button to register changes. The x-axis labels and tick marks will be shown with 'W' and 'E' appearing after the longitude values. Then select the List 'example' attribute set name in the yellow List scroll panel--the List Editor Panel will appear below. Scroll the window down until the '0' (zero) value is visible, then edit the 'String' side of the '0' value by entering 'Equator'. Select the red 'Apply' button to register the changes--the word 'Equator' will appear as an x axis label. The labels and tick marks 'xticklabels#2', 'xmtics#1', 'xmtics#2', 'yticlabels#1', 'yticlabels#2', 'ymtics#1' and 'ymtics#2' can be modified in the same manner.

See also Hints on the Boxfill Editor Panel for more information on modifying labels and tick marks.

Step 5: Defining Data Space in Real-World Coordinates

For the x-axis range on the VCS Canvas, set 'datawc_x1' and 'datawc_x2' in the Boxfill Editor Panel to values within that range (e.g., if x-axis range is -180 to 180, set new values -100 to 100). (*Note, if 'datawc_x1', 'datawc_x2', 'datawc_y1' or 'datawc_y2' has a value of '1e+20', then VCS will use the data's coordinate specified in the Dimension Manipulation Panel. That is, if either 'datawc_x1' or 'datawc_x2' is set to '1e+20', then no change will take place.) Then do the same for the 'datawc_y1' and 'datawc_y2' values in*

the Boxfill Editor Panel. *(Note, it is left up to the user to preserve the aspect ratio--e.g., 2:1 .)* If the chosen coordinate values fall outside the actual data range, no data will appear.

See also Hints on the Boxfill Editor Panel for more information on defining the data space in real-world coordinates.

Step 6: Changing the X- and Y-Axis Values

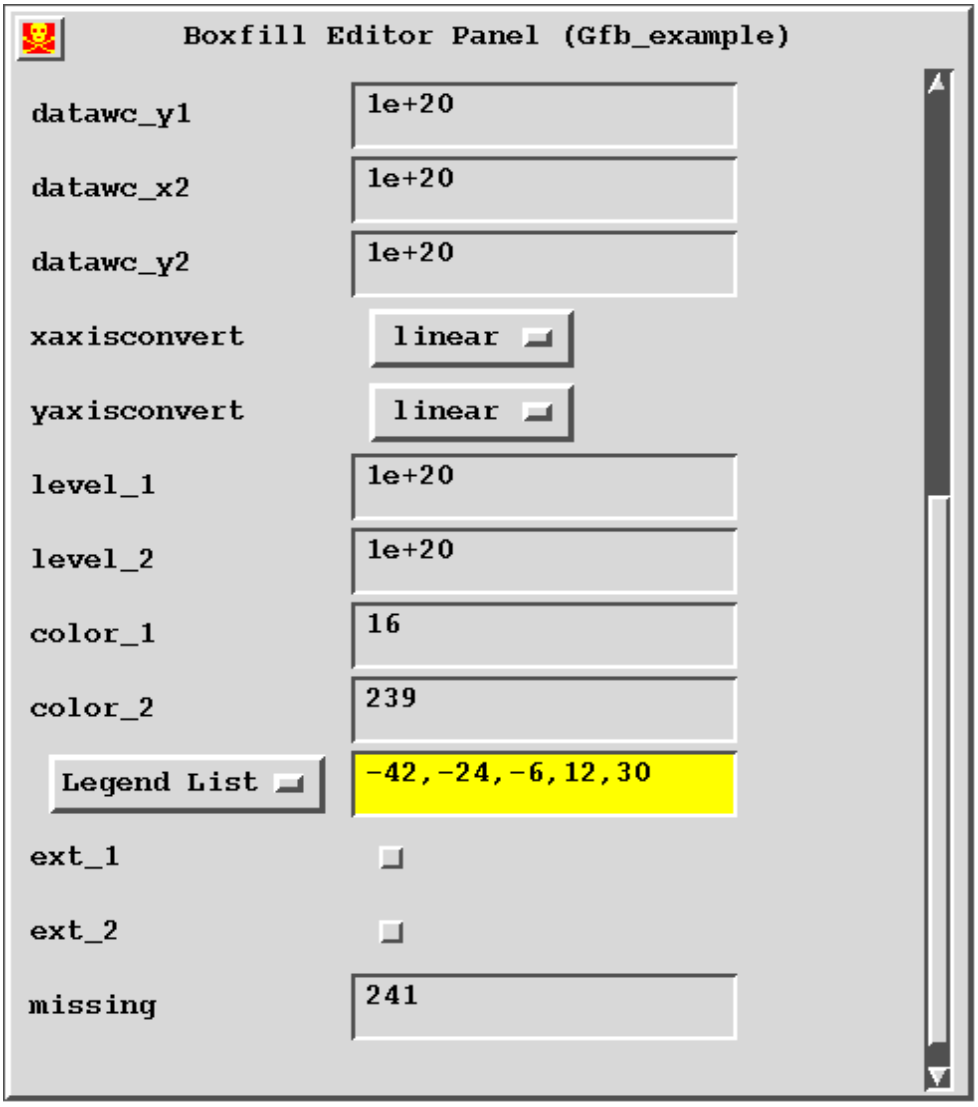
Before working on the remainder of this step, transpose the 'X-longitude' and 'Z-time' dimensions to obtain 'X-time', 'Y-latitude', and 'Z-longitude'--see Step 11 of the Example on Modifying Data for instructions.

Next, change the x-axis values on the VCS Canvas by scrolling the Boxfill Editor Panel down until the label 'xaxisconvert' is visible. Then move the pointer over the pulldown menu button (showing 'linear') and press and hold the left mouse button. Five options for converting the x-axis will appear: 'linear'; 'log10', for log base 10; 'ln', for natural log; 'exp', for exponential; and 'area_wt', for area-weighted. Move the pointer over 'log10' and release. Then select the red 'Apply' button at the top of the Boxfill Editor Panel to register the changes on the VCS Canvas. (*Note: if the map projection menu button is not set to 'Linear', then 'xaxisconvert' and 'yaxisconvert' will automatically default to 'linear'.*)

To view the border lines and the x- and y-tick marks, toggle the 'On/Off/Err' status button in the page descriptor form.

See also Hints on the Boxfill Editor Panel for more information on setting the X- and Y-axis values.

VCS Example: Modifying Boxfill Attributes



Description

The Boxfill graphics method draws color grid cells to represent the data on the VCS Canvas. In this example, the netCDF data file ***example.nc*** and the variable 'tas' are used, and the values in the last seven input windows (i.e., 'level_1', 'level_2', 'color_1', 'color_2', 'ext_1', 'ext_2', and 'missing') in the Boxfill Editor Panel (see above figure) are modified to illustrate the effects on the plot.

Step 1: Displaying Data with the Boxfill Graphics Method

Access the blue Boxfill Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - Boxfill). *Note, because VCS does not allow the modification of a 'default' attribute sets, this must be assigned a different name.* Therefore, move the pointer to the Boxfill 'default' attribute set name and click the *middle* mouse button. Next move the pointer over the Boxfill menu button, and press and hold the left mouse button. Then move over the 'Copy' menu item and release the left mouse button--a popup window will appear. Enter a new Boxfill attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name will appear in the blue Boxfill Graphics Method Panel. This is the new Boxfill attribute set that will be modified.

Use this newly created Boxfill attribute set name and the Boxfill 'default' attribute set name in the chosen picture descriptor form located in the Page Description Panel. Move the pointer over the ***example.nc*** file in the Data Selection Panel and click the left mouse button. Then move the pointer over the 'tas' variable in this Panel's 'Variables' scroll window and double-click the left mouse button. The data set attribute name 'tas (3D)' will appear in the red Data Panel above.

In order to display the data, select 'tas (3D)' in the red Data Panel with the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'tas (3D)' data with the Boxfill graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods).

Step 2: Accessing the Boxfill Editor Panel

Scroll down the window of the blue Boxfill Graphics Method Panel until the 'example' string is visible, then select 'example' with the left mouse button. (If 'example' is selected with the middle mouse button, VCS will copy 'example' into its copy buffer; if 'example' is selected with the right mouse button, VCS will delete 'example' from the list.) The Boxfill Editor Panel (see above figure) will appear below. Scroll this panel to the bottom.

Step 3: Changing the Displayed Minimum and Maximum Values

In the Boxfill Editor Panel, 'level_1' represents the minimun value for the plot and 'level_2' represents the maximum value. *Note, if 'level_1' or 'level_2' is equal to 1e+20, then VCS will display the plot using the minimum and maximun values from the data set. Therefore, both levels must be altered to register a change in the plot.*

In this example, the colorbar on the VCS Canvas shows the minimum value to be -42 and the maximun value to be +36 degrees C. Change 'level_1' to -10 and 'level_2' to 20. Select the red 'Apply' button with the left mouse button to register the changes. The plot will now only display data values in the chosen minimum and maximum range.

Step 4: Setting the Color Indices

In the Boxfill Editor Panel, 'color_1' represents the minimum color index value, and 'color_2' represents the maximum. There are 256 color indices. To view the colors and their indices, access the Colormap Editor/Table Panel.

In this example, the color index range is 'color_1' = 16 through 'color_2' = 239. Set 'color_1' to 100 and 'color_2' to 125. Select the red 'Apply' button with the left mouse button. The plot now uses the new color range; in this example, it turns yellow and orange in color.

Step 5: Setting the Label Values

In the Boxfill Editor Panel, if the menu button to the left displays 'Legend VCS', then VCS will generate the legend values; if 'Legend Pts' is displayed, then the legend values are generated given the number of intervals and the start and end legend points; if 'Legend List' is displayed, then the given list of values will be used to specify legend values.

In this example, the level_1 and level_2 values are 1e20; thus the minimun and maximum values are obtained from the data (e.g. minimum number is -40.0441 and maximum number is 35.0192). The legend values that are specified or generated outside the minimum and maximum value range will not be displayed.

Move the pointer over the 'Legend VCS' menu button and select and hold the left mouse button. Then move the pointer over the 'Legend Pts' menu item and release the left mouse button. Next, move the pointer over the yellow text input window and enter: **5, -40, 35**. The **5** represents the number of intervals, the **-40** represents the start value, and the **35** represents the end value. Select the red 'Apply' button to register the changes.

Move the pointer over the 'Legend Pts' menu button and press and hold the left mouse button. Then move the pointer over the 'Legend List' menu item and release the left mouse button. Next, move the pointer over the yellow text input window and enter: **-42, -24, -6, 12, 30**, a list that specifies the label values. Select the red 'Apply' button to register these changes.

For the ‘Legend Pts’ and ‘Legend List’ menu options, the values can be obtained from a List attribute set: enter the List attribute set name in the yellow input text window of the Boxfill Editor Panel.

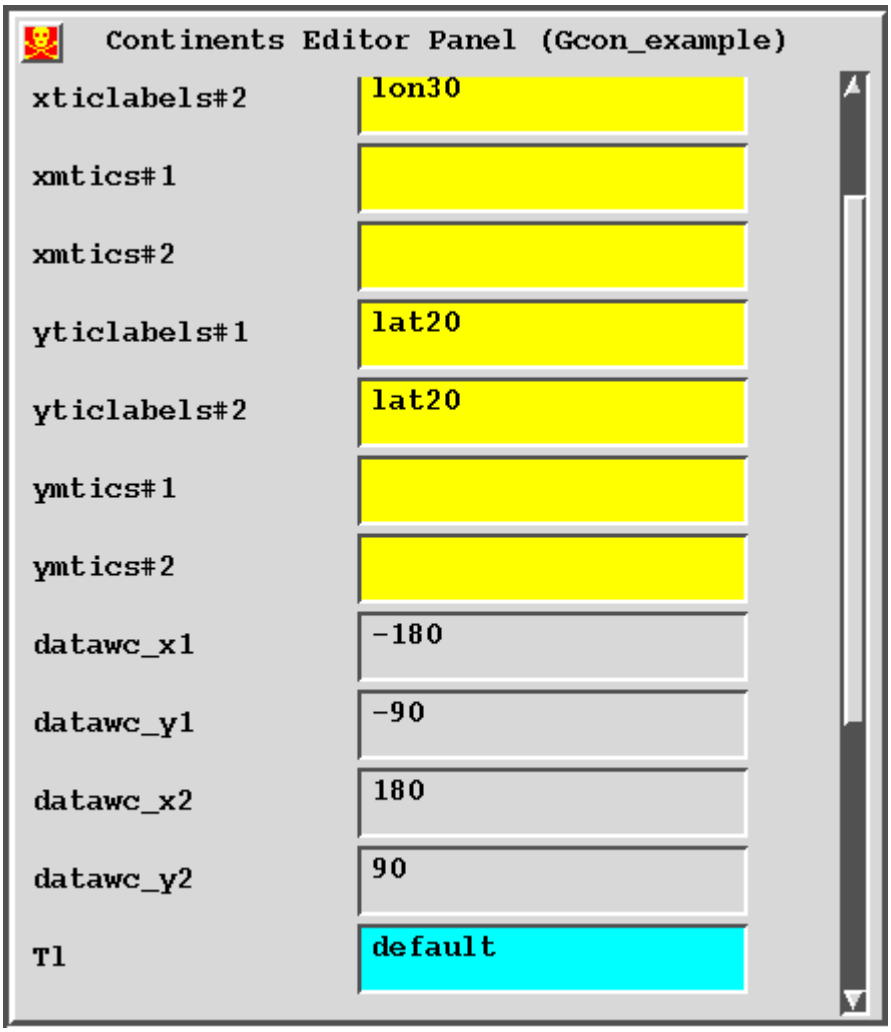
Step 6: Indicating the Presence of Overflow and Underflow Values

In the Boxfill Editor Panel, ‘ext_1’ displays the values less than ‘level_1’ with the specified ‘color_1’ color index value and ‘ext_2’ displays the values greater than ‘level_2’ with the specified ‘color_2’ color index value. From Step 3 above, the values of ‘level_1’ and ‘level_2’ should be set to -10 and +20, respectively. Now instead, depress ‘ext_1’ and ‘ext_2’ toggle buttons with the left mouse button, and select the red ‘Apply’ button at the top of the Boxfill Editor Panel to view the results. Arrows will appear on both sides of the colorbar on the VCS Canvas indicating the presence of underflow and overflow values.

Step 7: Displaying Missing Values

The color index value for missing data is specified by the ‘missing’ input text window in the Boxfill Editor Panel. If there are missing data, modify this input text window to the desired color index. (*Note, there are no missing data in example file* ***example.nc***.)

VCS Example: Modifying Continents Attributes



Description

The Continents graphics method draws a predefined, generic set of continental outlines in a longitude by latitude space. (To draw continental outlines, no external data set is required.) This example shows how to display the continental outlines on the VCS Canvas and how to change the associated line attribute 'Tl'.

Step 1: Displaying Data with the Continents Graphics Method

Access the blue Continents Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Continents'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, move the pointer to the 'default' attribute set of the Continents Panel and click the *middle* mouse button. Next move the pointer over the 'Continents' menu button, and press and hold the left mouse button. Then move over the 'Copy' item and release the left mouse button--a popup window will appear. Enter a new 'Continents' attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name will appear in the blue Continents Graphics Method Panel. This is the new attribute set that will be modified in this example.

Use this newly created attribute set and the Template Panel's 'default' attribute set in the chosen picture descriptor form located in the Page Description Panel.

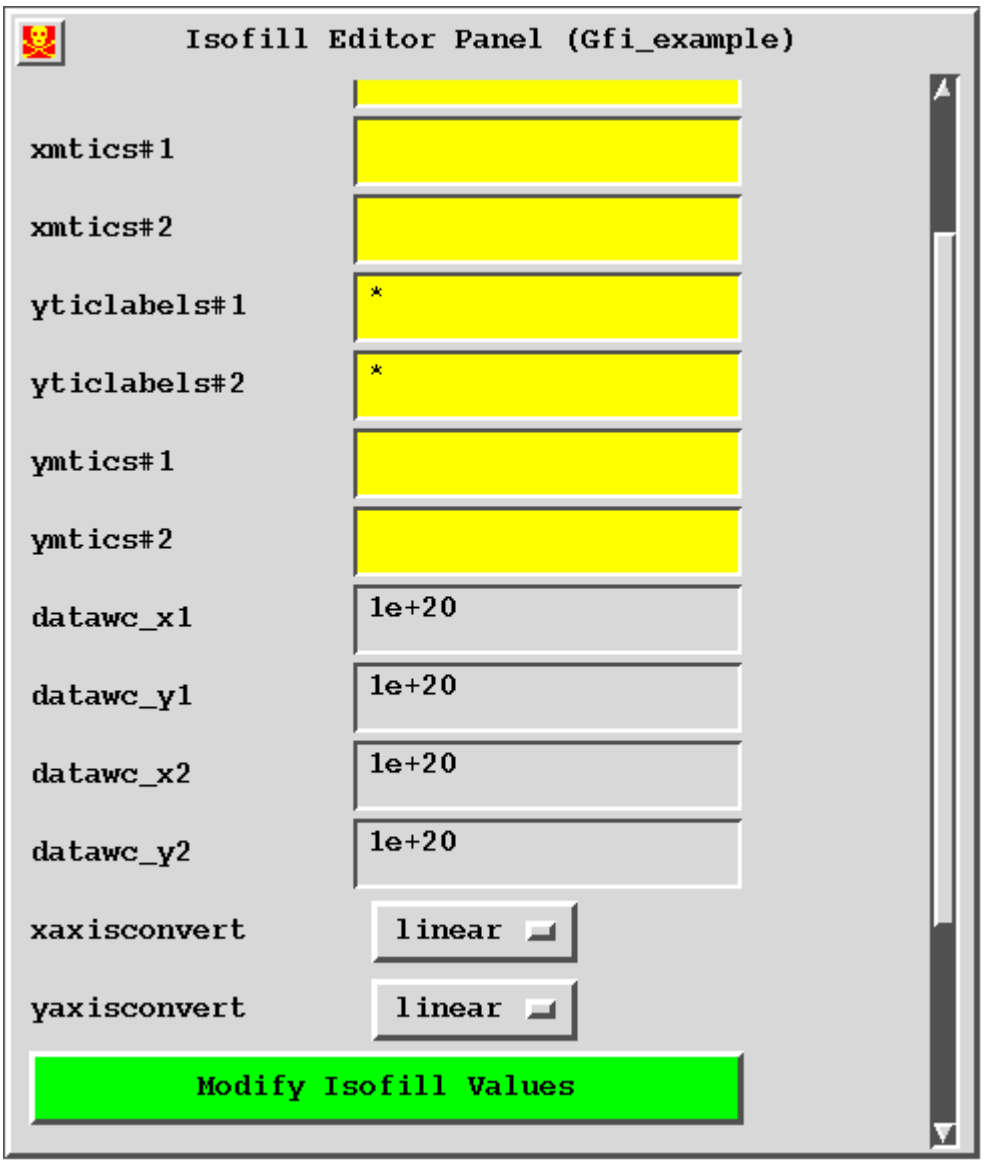
Step 2: Accessing the Continents Editor Panel

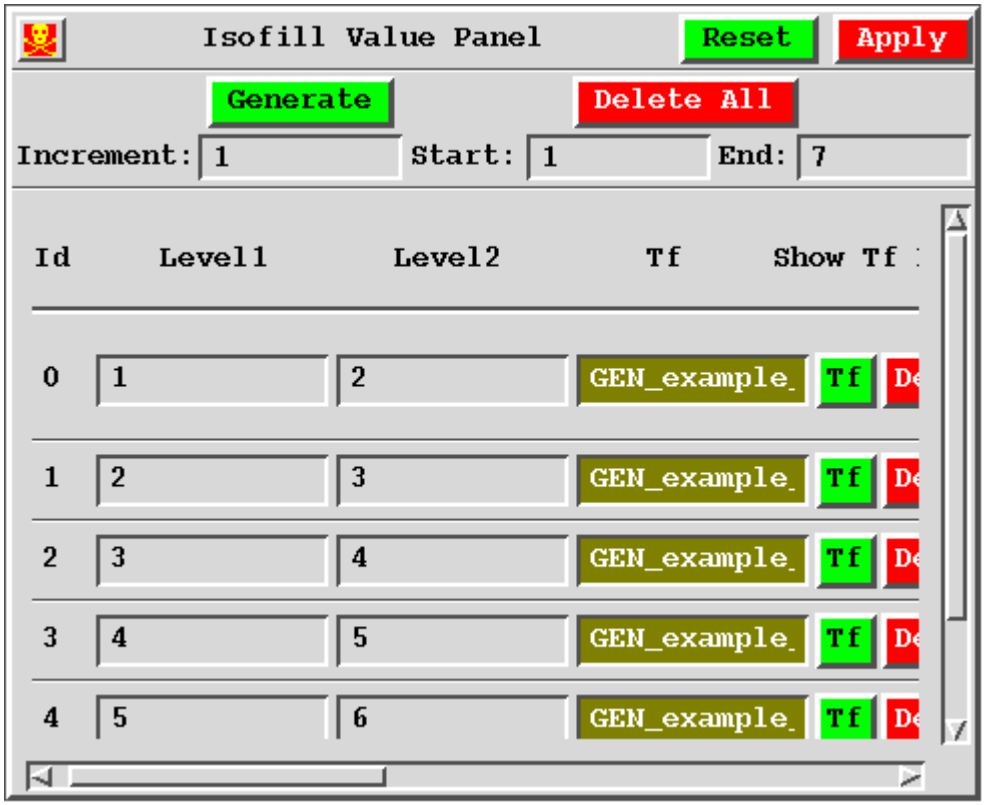
Scroll down the window of the blue Continents Graphics Method Panel until the 'example' string is visible. Then select 'example' with the left mouse button. (If 'example' is selected with the middle mouse button, VCS will copy 'example' into its copy buffer; if 'example' is selected with the right mouse button, VCS will delete 'example' from the list.) The Continents Editor Panel (see above figure) will appear below. Scroll this panel to the bottom.

Step 3: Changing the Line Attribute

Access the cyan (Tl) Line Table Panel (via Main Menu: 'Basic' - 'Line Table (Tl)'). Select one of the Line Table Panel's attribute names other than 'default' (e.g., 'std') with the *middle* mouse button. Then move to the cyan input text window on the Line Table Panel, and click the *middle* mouse button. The name 'default' will be replaced. Select the red 'Apply' button to register the results.

VCS Example: Modifying Isofill Attributes





Description

The Isofill graphics method fills the area between selected isolevels (levels of constant value) of a two-dimensional array with a user-specified color. This example shows how to display an isofill plot on the VCS Canvas, how to create and remove isofill isolevels, and how to display and modify the fillarea attribute 'Tf'.

Step 1: Displaying Data with the Isofill Graphics Method

Access the blue Isofill Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Isofill'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, move the pointer over the Isofill 'default' attribute set name and click the *middle* mouse button. Next move the pointer over the Isofill menu button, and press and hold the left mouse button. Then move over the 'Copy' item and release the left mouse button--a popup window will appear. Enter a new Isofill attribute set name (e.g., 'example'), and select the 'Save' button. The 'example' attribute set name will appear in the blue Isofill Graphics Method Panel. This is the new 'Isofill' attribute set that will be modified in this example.

Use this newly created 'Isofill' attribute set name and the Template Panel's 'default' attribute set name in the chosen picture descriptor form located in Page Description Panel. Move the pointer over the ***example.nc*** file in the Data Selection Panel, and click the left mouse button. Then move the pointer over the 'tas' variable in this Panel's 'Variables' scroll window and double-click the left mouse button. The data set attribute name 'tas (3D)' will appear in the red Data Panel above.

In order to display the data, move the pointer over 'tas (3D)' in the red Data Panel, and click the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'tas (3D)' data with the Isofill graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods).

Step 2: Accessing the Isofill Editor Panel

Scroll down the window of the blue Isofill Graphics Method Panel until the 'example' string is visible, then select 'example' with the left mouse button. (If 'example' is selected with the middle mouse button, VCS will copy 'example' into its copy buffer; if 'example' is selected with the right mouse button, VCS will delete 'example' from the list.) The Isofill Editor Panel will appear below. Scroll this Panel to the bottom.

Step 3: Accessing the Isofill Value Panel

The Isofill Value Panel allows the creation and modification of isolevels. Select the green 'Modify Isofill Values' button on the Isofill Editor Panel. The Isofill Value Panel then will appear in front of the Isofill Editor Panel.

Step 4: Generating Isolevels

To generate isolevels, enter the increment number (e.g., 2) in the Isofill Value Panel's 'Increment' input text window, enter the beginning isolevel value (e.g., -30) in the 'Start' input text window, and enter the last isolevel value (e.g., 30) in the 'End' input text window . Then select the green 'Generate' button with the left mouse button--the isolevel values will be generated below. Select the red 'Apply' button to register the results on the VCS Canvas.

Step 5: Modifying the Fillarea Attribute

To modify the Fillarea attribute, select the first green 'Tf' button in the Isofill Value Panel.(If the green 'Tf' button is not visible, then scroll the window to the right.) The Fillarea Editor Panel will appear above the Isofill Value Panel. Modify the 'Interior Style' to 'Hatch', and select the red 'Apply' button to register the results on the VCS Canvas. (See Hints on the Fillarea Editor Panel for futher instructions on modifying Fillarea attributes.)

Step 6: Modifying an Isolevel

For the isolevel '-30' to '-28', change '-30' to '-40'. Select the red 'Apply' button to register the results on the VCS Canvas.

Step 7: Deleting an Isolevel

To delete an isolevel, select the first red 'Delete' button in the Isofill Value Panel. (If the red 'Delete' button is not visible, scroll the window to the right.) The isolevel will be removed. Select the red 'Apply' button to register the results on the VCS Canvas.

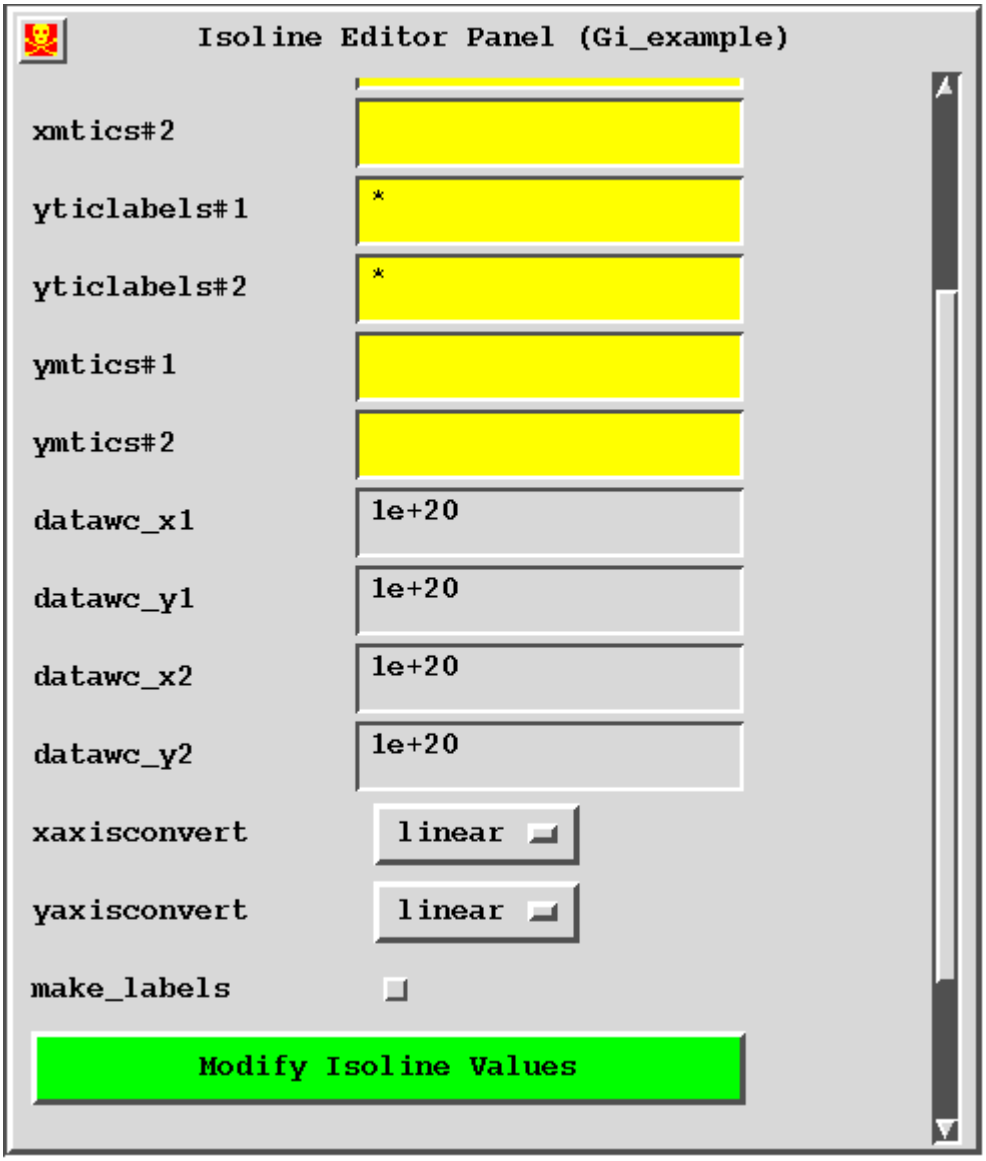
Step 8: Deleting all Isolevels

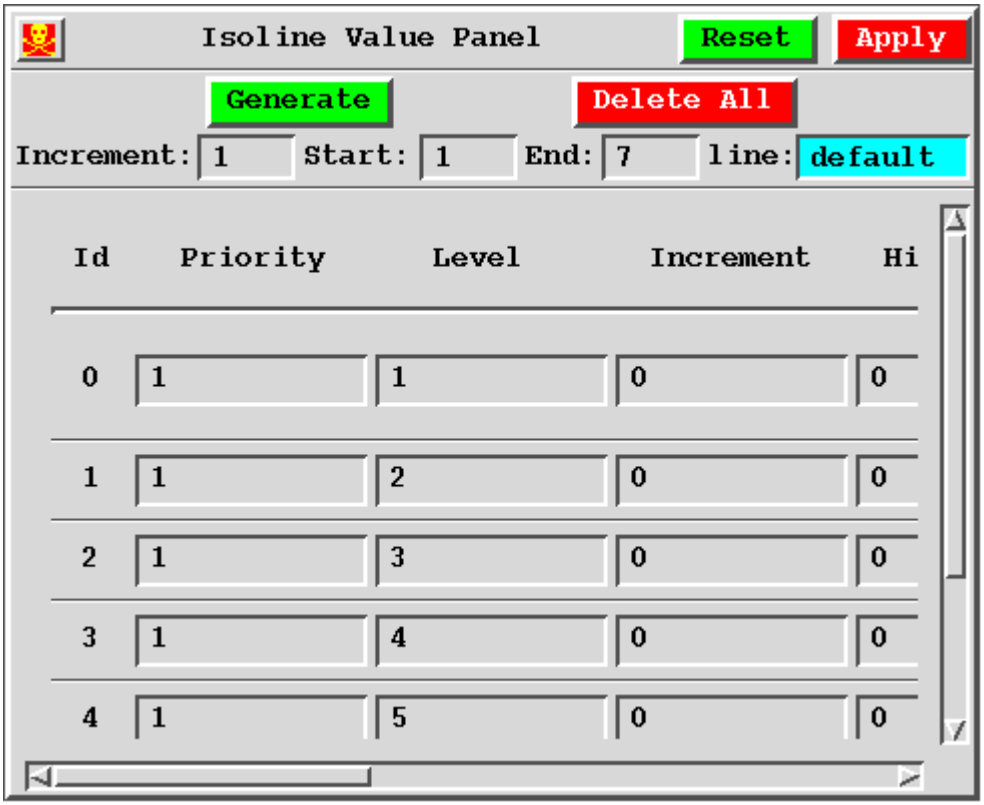
To delete all generated isolevels, select the red 'Delete All' button in the upper right porton of the Isofill Value Panel.

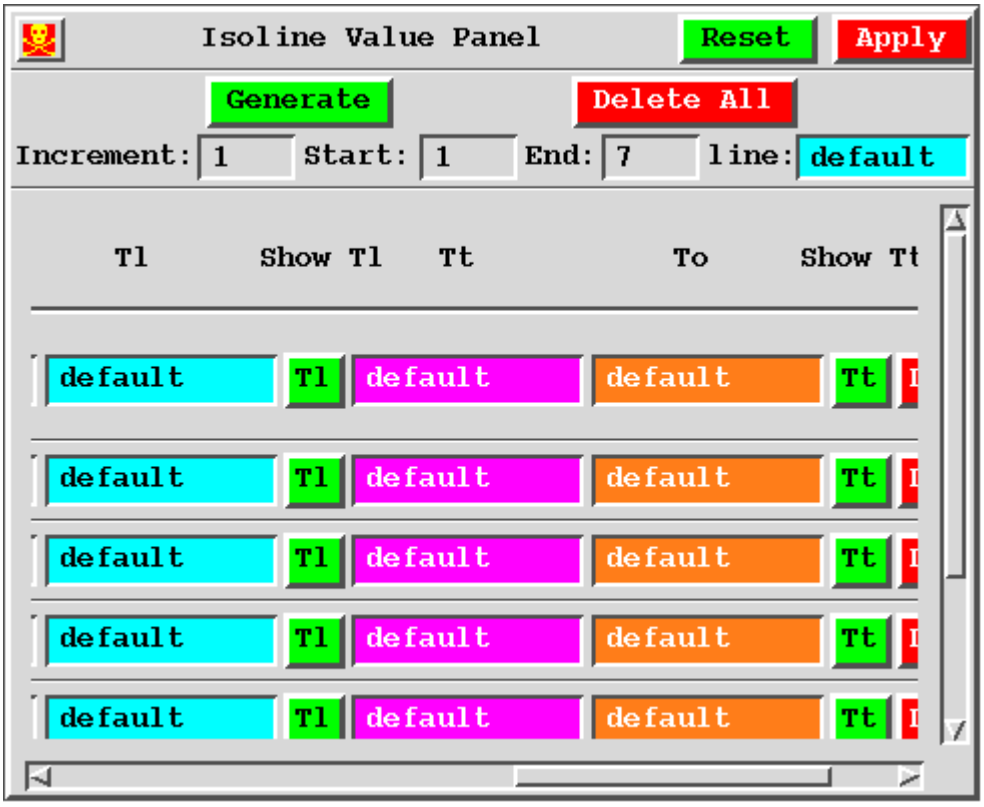
Step 9: Changing the Fillarea Attibute

Access the Fillarea Table Panel (via Main Menu: 'Basic' - 'Fillarea Table (Tf)'). Move the pointer over the olive green scroll window and select 'default' with the *middle* mouse button. Then move the pointer over the first olive green input text window in the Isofill Value Panel and click the *middle* mouse button. The 'default' text string will replace the previous string. Select the red 'Apply' button to register the results on the VCS Canvas.

VCS Example: Modifying Isoline Attributes




Isoline Value Panel
Reset
Apply
Generate
Delete All
Increment: 1
Start: 1
End: 7
line: default
Id
Priority
Level
Increment
Hi
0 1 1 0 0
1 1 2 0 0
2 1 3 0 0
3 1 4 0 0
4 1 5 0 0


Isoline Value Panel
Reset
Apply
Generate
Delete All
Increment: 1
Start: 1
End: 7
line: default
Tl
Show Tl
Tt
To
Show Tt
default Tl default default Tt
default Tl default default Tt
default Tl default default Tt
default Tl default default Tt
default Tl default default Tt

Description

The Isoline graphics method draws lines of constant value at specified levels in order to graphically represent a two-dimensional array. It also labels the values of these isolines on the VCS Canvas. This example shows how to plot isolines of different types at specified levels and how to create isoline labels having user-specified text and background color.

Step 1: Displaying Data by the Isoline Graphics Method

Access the blue Isoline Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Isoline'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, move the pointer to the Isolevel 'default' attribute set name and click the *middle* mouse button. Next move the pointer over the 'Isoline' menu button, and press and hold the left mouse button. Then move over the 'Copy' item and release the left mouse button--a popup window will appear. Enter a new 'Isoline' attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set will appear in the blue Isoline Graphics Method Panel. This is the new Isoline attribute set that will be modified in this example.

Use this newly created Isoline attribute set and the Template Panel's 'default' attribute set in the chosen picture descriptor form located in the Page Description Panel. Move the pointer over the ***example.nc*** file in the Data Selection Panel and click the left mouse button. Then move the pointer over 'tas' variable in this Panel's 'Variables' scroll window and double-click the left mouse button. The data set attribute name 'tas (3D)' will appear in the red Data Panel above.

In order to display the data, select 'tas (3D)' with the *middle* mouse button in the red Data Panel. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'tas (3D)' data with the Isoline graphics method on the VCS Canvas. (See also the Example on Creating Plots by Different Graphics Methods).

Step 2: Accessing the Isoline Editor Panel

Scroll down the window of the blue Isoline Graphics Method Panel until the 'example' string is visible, then select 'example' with the left mouse button. (*Note, if 'example' is selected with the middle mouse button, VCS will copy 'example' into its copy buffer; if 'example is selected with the right mouse button, VCS will delete 'example' from the list*). The Isoline Editor Panel and an Isolevel Panel that displays attributes of the isolevels (see above figure) will appear below--scroll this Panel to the bottom.

Step 3: Displaying Isoline Labels

To display isoline labels, scroll the Isoline Editor Panel to the bottom and select the 'make_labels' toggle button. Then select the red 'Apply' button to register the results on the VCS Canvas.

Step 4: Accessing the Isoline Value Panel

The Isoline Value Panel allows the creation and modification of individual isolines. Select the green 'Modify Isoline Values' button on the Isoline Editor Panel. The Isoline Value Panel then will appear in front of the Isoline Editor Panel.

Step 5: Generating Isolevels

To generate isolines, enter the increment number (e.g., 2) in the Isoline Value Panel's 'Increment' input text window, enter the beginning isoline value (e.g., -30) in the 'Start' input text window, enter the last isoline value (e.g., 30) in the 'End' input text window, and enter the line type (e.g., 'red') in the 'line' input text window. Then select the green 'Generate' button with the left mouse button--the isoline values will be generated below. Select the red 'Apply' button to register the results on the VCS Canvas.

Step 6: Specifying the Line Type of an Individual Isoline

To specify the line type of individual isolines, access the (Tl) Line Table Panel (via Main Menu, 'Basic' - 'Line Table (Tl)'). Select the Line Table Panel's 'std' attribute set name with the *middle* mouse button. Then move the pointer to the desired isoline's cyan 'Tl' input text window (on the Isoline Value Panel) and click the *middle* mouse

button. The 'red' (or 'default') text string will be replaced with the 'std' text string. Select the red 'Apply' button to register the results on the VCS Canvas.

Step 7: Modifying the Line Attributes

To modify the line attributes, select the first green 'Tl' button in the desired isoline row of the Isoline Value Panel . (If the green 'Tl' button is not visible, then scroll the Isoline Value Panel's scroll window to the right.) The Line Editor Panel will appear above the Isoline Value Panel. Modify the 'Line Type' (e.g., 'SOLID' to 'DASHED'), and select the red 'Apply' button to register the results on the VCS Canvas. (See Hints on the Line Editor Panel for futher instructions on modifying Line attributes.)

Step 8: Specifying the Label Text Type of an Individual Isoline

To specify the isoline labels' text type, access the (Tt) Text Table Panel (via Main Menu: 'Basic' - 'Text Table (Tt) and (To)'). Move the pointer over the magenta (Tt) Text Panel's 'std' attribute set name and click the *middle* mouse button. Then move the pointer to the desired isoline's magenta 'Tt' input text window (on the Isoline Value Panel) and click the *middle* mouse button. The 'default' text string will be replaced by the 'std' text string. Select the red 'Apply' button to register the results on the VCS Canvas.

Step 9: Specifying the Text Orientation Type of an Individual Isoline

To specify the isoline labels' text orientation, access the (To) Text Orientation Panel (via Main Menu: 'Basic' - 'Text Table (Tt) and (To)'). Move the pointer over the orange (To) Text Orientation Panel and select the 'defcentup' attribute set name with the *middle* mouse button. Then move the pointer to the desired isoline's orange 'To' input text window (on the Isolline Value Panel) and click the *middle* mouse button. The 'default' text string will be replaced by the 'defcentup' text string. Select the red 'Apply' button to register the results on the VCS Canvas.

Step 10: Modifying the Text and Text Orientation Attributes

To modify the text and text orientation attributes, select the green 'Tt' button in the desired isoline row of the Isoline Value Panel. (If the green 'Tt' button is not visible, then scroll the Isoline Value Panel's scroll window to the right.) The Text Editor Panel will appear over the Isoline Value Panel. Modify the 'Font' (e.g., 'Font 1' to 'Font 9'), and select the red 'Apply' button to register the results on the VCS Canvas. (See Hints on the Text Editor Panel for futher instructions on modifying Line attributes.)

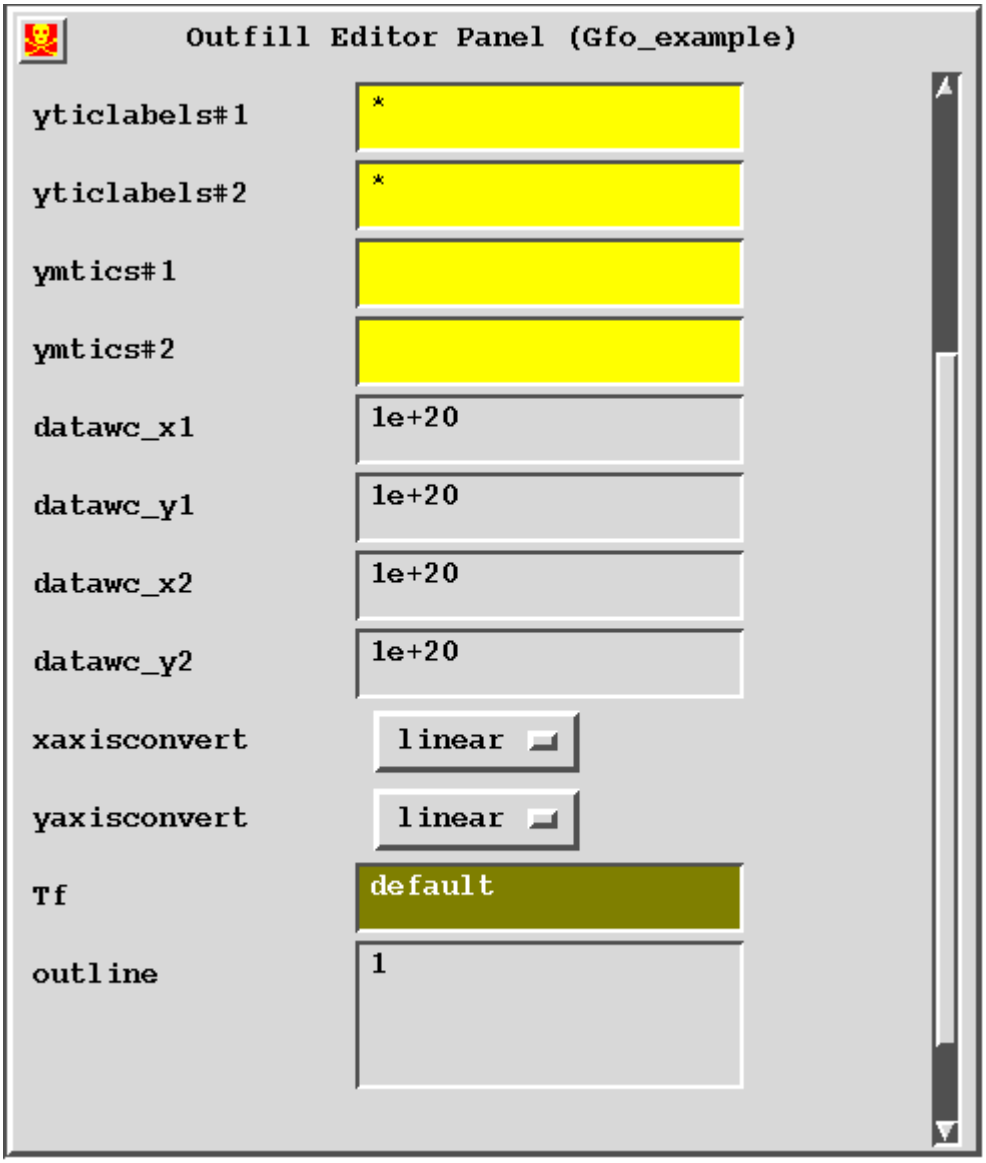
Step 11: Deleting an Isoline

To delete an isoline, select the first red 'Delete' button in the desired isoline row of the Isoline Value Panel. (If the red 'Delete' button is not visible, then scroll the Isoline Value Panel's scroll window to the right.) The chosen isoline will be removed. Select the red 'Apply' button to register the results on the VCS Canvas.

Step 12: Deleting all Isolines

To delete all generated isolines, select the red 'Delete All' button in the upper right part of the Isoline Value Panel.

VCS Example: Modifying Outfill Attributes



Description

The Outfill graphics method fills a set of integer values in any data array. Its primary purpose is to display continents by filling their area as defined by a surface type array that indicates land, ocean, and sea-ice points. This example shows how to apply the Outfill graphics method and how to modify Fillarea and Outline attributes.

Step 1: Displaying Data with the Outfill Graphics Method

Access the blue Outfill Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Outfill'). *Note, VCS does not allow the modification of any 'default' named attribute sets.* Therefore, select the Outfill 'default' attribute set name with the *middle* mouse button. Then select and hold the 'Outfill' menu button with the left mouse button. Move over the 'Copy' item and release--a popup window will appear. Enter a new Outfill attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name will appear in the blue Outfill Graphics Method Panel. This is the new Outfill attribute set that will be modified in this example.

Use this newly created Outfill attribute set name and the Template Panel's 'default' attribute set in the chosen picture

descriptor form located in the Page Description Panel. Select the ***example.nc*** file in the Data Selection Panel, move the pointer over the 'sft' string in this Panel's 'Variables' scroll window, and double-click the left mouse button.The data set attribute name 'sft (2D)' then will be displayed in the red Data Panel above.

In order to display the data, select 'sft (2D)' with the *middle* mouse button in the red Data Panel. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'sft (2D)' data with filled continental outline on the VCS Canvas. (See also the Example on Creating Plots by Different Graphics Methods).

Step 2: Accessing the Outfill Editor Panel

Scroll down the window of the blue Graphics Method Panel until the 'example' string is visible, and select it with the left mouse button. (If 'example' is selected with the middle mouse button, VCS will copy 'example' into its copy buffer; if 'example is selected with the right mouse button, VCS will delete 'example' from the list). The Outfill Editor Panel (see above figure) will appear below. Scroll the panel to the bottom, so that the 'Tf' and 'outline' input text windows are visible.

Step 3: Changing the Fillarea Attribute

To change the Fillarea attribute, access the (Tf) Fillarea Table Panel (via Main Menu: 'Basic' - 'Fillarea Table (Tf)'). Move the pointer over the olive green scroll window and select 'def42' with the *middle* mouse button. Then move the pointer over the olive green input text window in the Outfill Editor Panel and click the *middle* mouse button. The 'def42' text string will replace the 'default' string. Select the red 'Apply' button to register the results on the VCS Canvas.

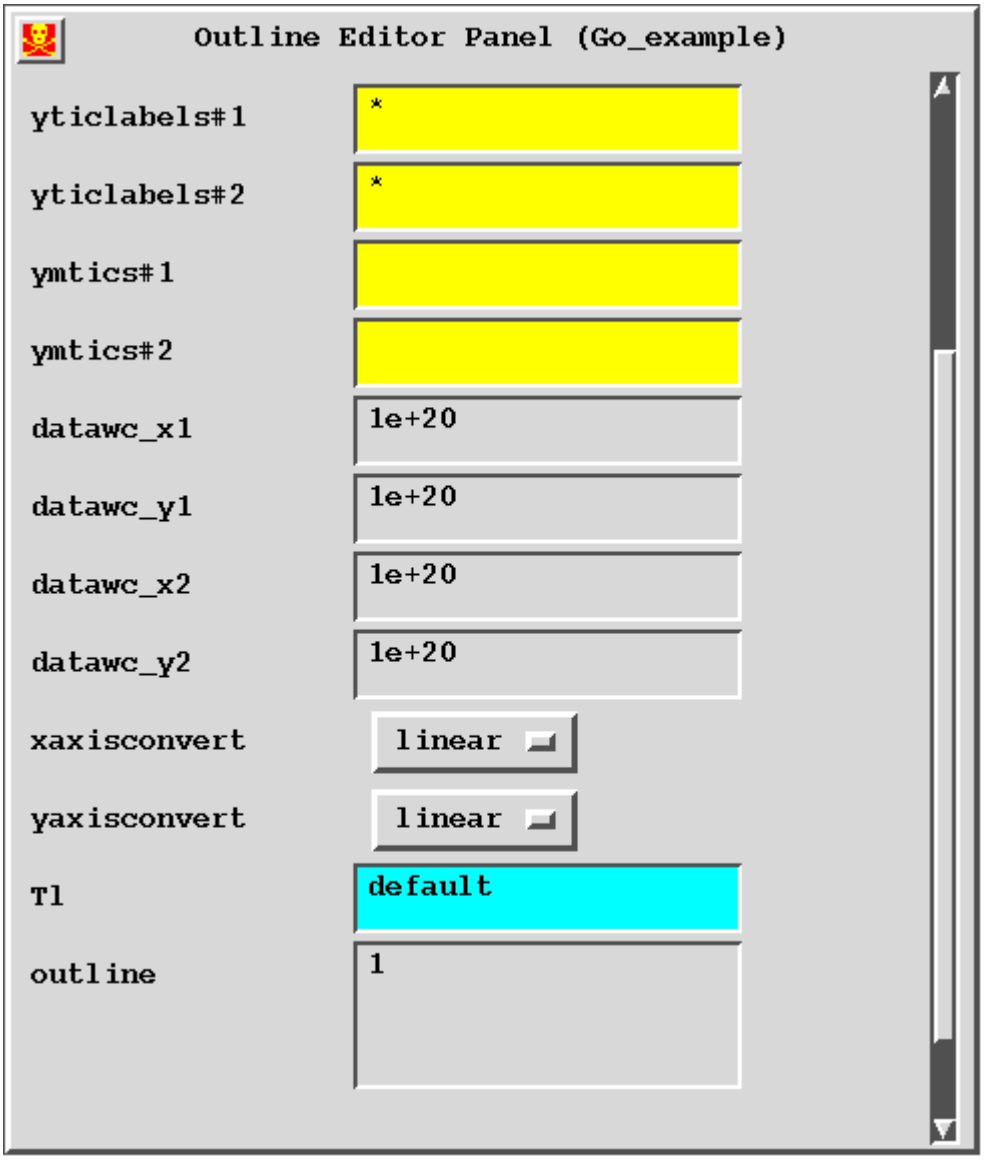
See also Hints on the Fillarea Editor Panel for further details on changing Fillarea attributes.

Step 4: Changing the Outline

To change the outline, edit the 'outline' input text window in the Outfill Editor Panel by changing the '1' to a '0'. Select the red 'Apply' button to view the results on the VCS Canvas. Then change the '0' to '0,1' and select the red 'Apply' button to register these results on the Canvas.

See also the Hints on the Outfill Editor Panel for further details.

VCS Example: Modifying Outline Attributes



Description

The Outline graphics method outlines a set of integer values in any data array. Its primary purpose is to display continental outlines as defined by a surface type array that indicates land, ocean, and sea-ice points. This example shows how to change such an outline by use of the Outline Editor Panel (see above figure).

Step 1: Displaying data with the Outline Graphics Method

Access the blue Outline Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Outline'). *Note, VCS does not allow the modification of any 'default' named attribute sets.* Therefore, move the pointer to the Outline 'default' attribute set and click the *middle* mouse button. Next move the pointer over the 'Outline' menu button, and press and hold the left mouse button. Then move over the 'Copy' item and release the left mouse button--a popup window will appear. Enter a new Outline attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name then will appear in the blue Outline Graphics Method Panel. This is the new Outline attribute set that will be modified in this example.

Use this newly created 'Outline' attribute set name and the Template Panel's 'default' attribute set in the chosen

picture descriptor form located in the Page Description Panel. Select the ***example.nc*** file in Data Selection Panel. Then move the pointer over the 'sft' variable in this Panel's 'Variables' scroll window and double-click the left mouse button. The data set attribute name 'sft (2D)' will be displayed in the red Data Panel above.

In order to display the data, select 'sft (2D)' in the red Data Panel with the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and press the *middle* mouse button. This action will plot the 'sft (2D)' data with the Outline graphics method on the VCS Canvas--that is, the outlined continents will be displayed (See the Example on Creating Plots by Different Graphics Methods).

Step 2: Accessing the Outline Editor Panel

Scroll down the blue window of the Outline Graphics Method Panel until the 'example' string is visible. Then select 'example' with the left mouse button. (If 'example' is selected with the middle mouse button, VCS will copy 'example' into its copy buffer; if 'example is selected with the right mouse button, VCS will delete 'example' from the list.) The Outline Editor Panel (see above figure) will appear below. Scroll the panel to the bottom, so that the 'Tl' and 'outline' input text windows are visible.

Step 3: Changing the Line Attribute

To change the line attribute, access the (Tl) Line Table Panel (via Main Menu: 'Basic' - 'Line Table (Tl)'). Then move the pointer over the cyan (Tl) Line Panel and select 'std' with the *middle* mouse button. Next, move the pointer over the cyan input text window in the Outline Editor Panel and click the *middle* mouse button. The 'std' text string will replace the 'default' string. Select the red 'Apply' button to register the results on the VCS Canvas.

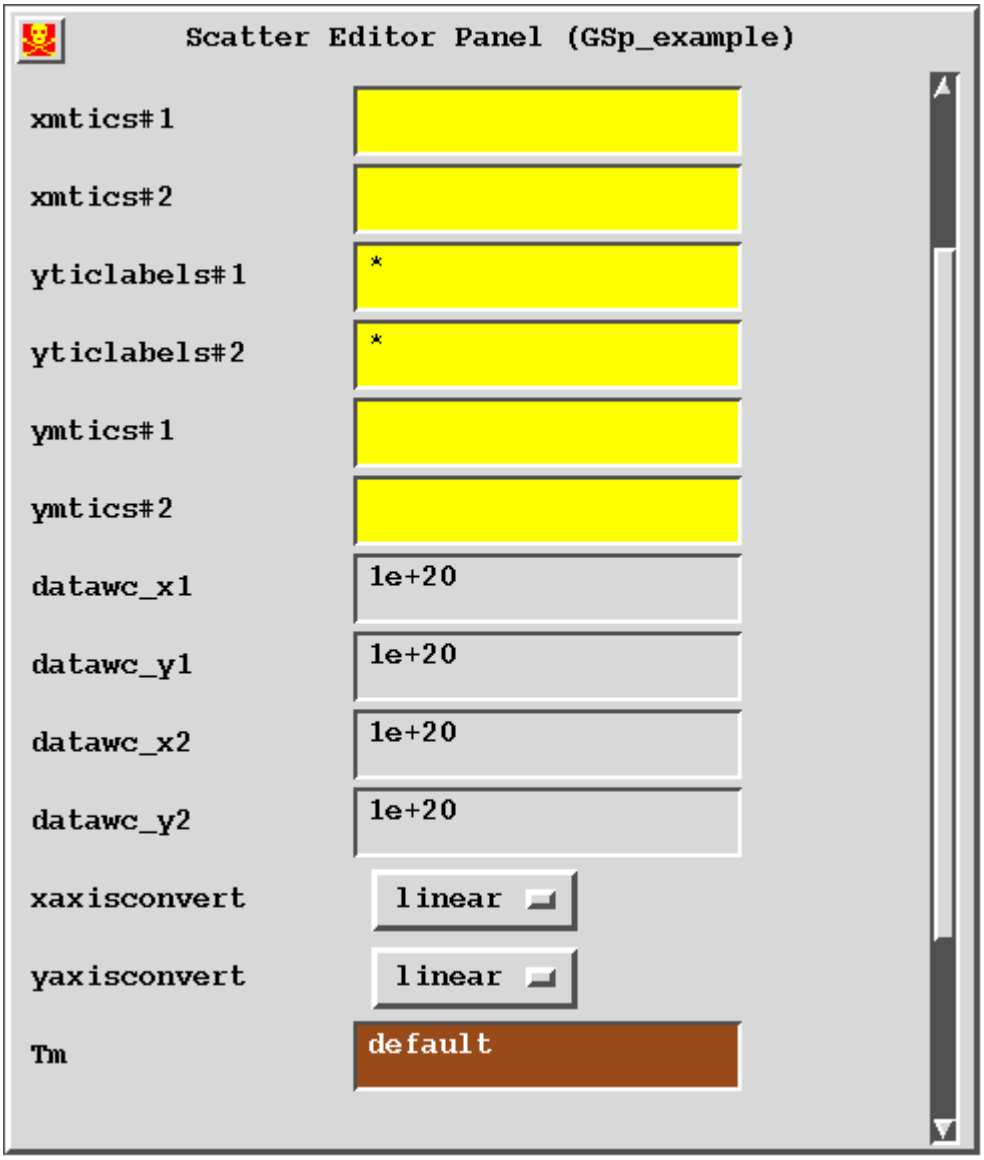
See also Hints on the Line Editor Panel for further details on changing line attributes.)

Step 4: Changing the Outline

To change the outline, edit the 'outline' input text window and change the '1' to a '0'. Select the red 'Apply' button to register the results on the VCS Canvas. Then change the '0' to '0,1' and select the red 'Apply' button to register these results.

See also Hints on the Outline Editor Panel for further details.

VCS Example: Modifying Scatter Attributes



Description

The Scatter graphics method displays a scatter plot of two 4-dimensional data arrays, e.g. A(x,y,z,t) and B(x,y,z,t). This example shows how to change the marker attributes of a scatter plot by use of the Scatter Editor Panel.

Step 1: Displaying Data with the Scatter Graphics Method

Access the blue Scatter Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Scatter'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, select the Scatter 'default' attribute set with the *middle* mouse button. Then select and hold the 'Scatter' menu button with the left mouse button. Move the left mouse button over the 'Copy' item and release--a popup window will appear. Enter a new Scatter attribute set name (e.g., 'example') and press the 'Save' button. The 'example' attribute set name then will appear in the blue Scatter Graphics Method Panel. This is the new Scatter attribute set that will be modified in this example.

Use this newly created Scatter attribute set name and the Template Panel's 'default' attribute set in the chosen picture descriptor form located in the Page Description Panel. Select the ***example.nc*** file in the Data Selection Panel, and

double-click with the left mouse button on the 'u' and 'v' variables in this Panel's 'Variables' scroll window. The data set attribute names 'u (4D)' 'v (4D)' will be displayed in the red Data Panel above.

In order to display the data, select red Data Panel's 'u (4D)' string with the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and press the *middle* mouse button. Do the same for the 'v (4d)' variable, after first scrolling the Page Description Panel leftward to reveal a second red input text window in the picture description form. These actions will plot the two data sets with the Scatter graphics method on the VCS Canvas. (Because of the large size of these data sets, there may be a substantial wait time to view the display.) See also the Example on Creating Plots by Different Graphics Methods.

Step 2: Accessing the Scatter Editor Panel

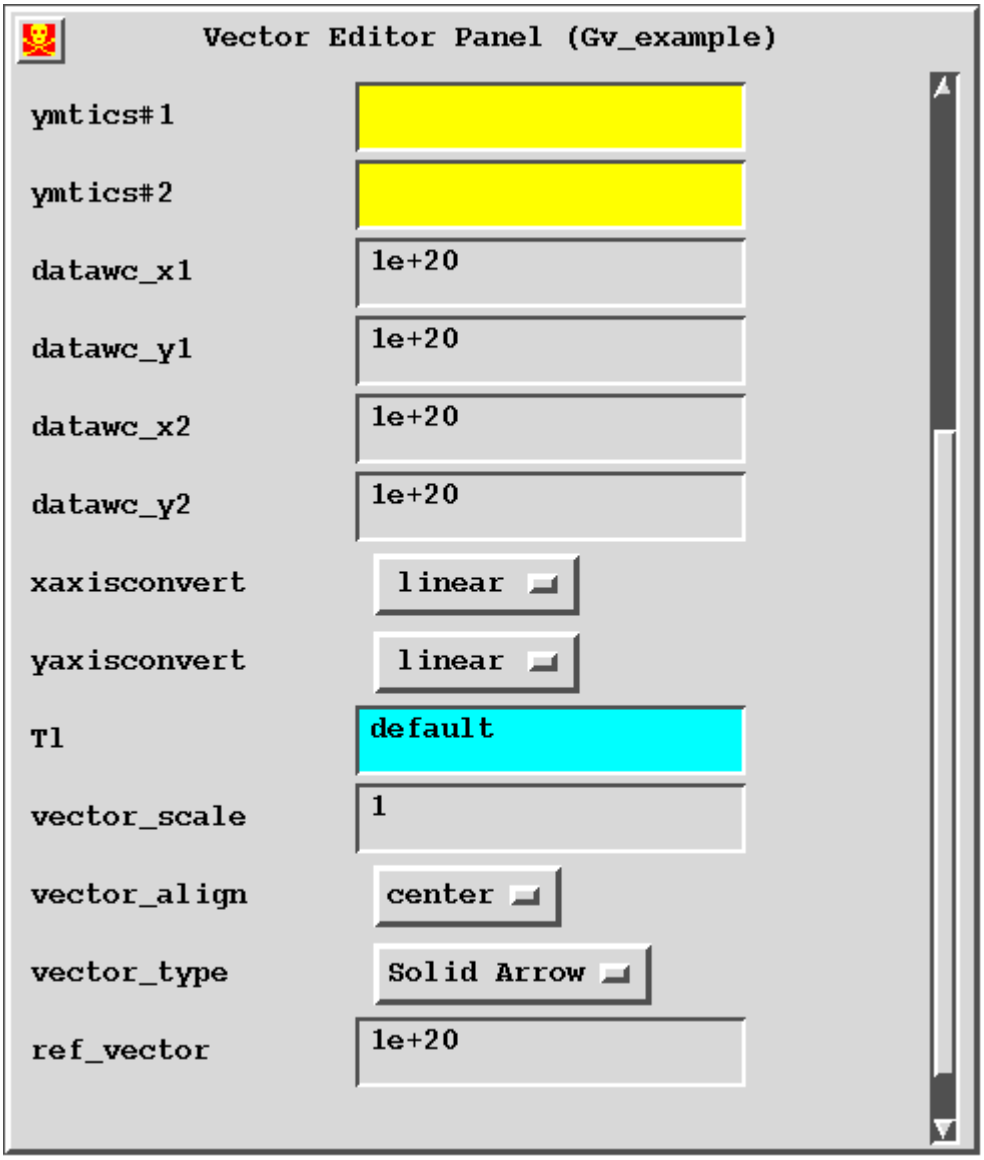
Scroll down the blue window of the Scatter Graphics Method Panel until the 'example' string is visible, and select 'example' with the left mouse button. (If 'example' is selected with the *middle* mouse button, VCS will copy 'example' into its copy buffer; if 'example is selected with the right mouse button, VCS will delete 'example' from the list.) The Scatter Editor Panel (see above figure) will appear below. Scroll the panel to the bottom, so that the 'Tm' input text window is visible.

Step 3: Changing the Marker Attribute

To change the marker attribute, access the (Tm) Marker Table Panel (via Main Menu: 'Basic' - 'Marker Table (Tm)'). Then select the Marker Table Panel's 'red' attribute set with the *middle* mouse button. Next, move the pointer over the brown 'Tm' input text window in the Scatter Editor Panel and click the *middle* mouse button--the 'red' text string will replace the 'default' string. Press the red 'Apply' button to register the results on the VCS Canvas.

See also Hints on the Marker Editor Panel for further details on changing marker attributes.

VCS Example: Modifying Vector Attributes



Description

The Vector graphics method displays a vector plot of a 2D vector field. Vectors are located at the coordinate locations and point in the direction of the data vector field. Vector magnitudes are the product of data vector field lengths and a scaling factor. This example shows how to modify the vector line, scale, alignment, type, and reference.

Step 1: Displaying Data with the Vector Graphics Method

Access the blue Vector Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Vector'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, select the Vector 'default' attribute set name with the *middle* mouse button. Then move the pointer over the 'Vector' menu button and press and hold the left mouse button. Next, select the 'Copy' menu item and release--a popup window will appear. Enter a new Vector attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name will appear in the blue Vector Graphics Method Panel. This is the Vector attribute set that will be modified in this example.

Use this newly created Vector attribute set name and the Template Panel's 'default' attribute set in the chosen picture descriptor form located in the Page Description Panel. Select the ***example.nc*** file in the Data Selection Panel, move the pointer over the 'u' variable in this Panel's 'Variables' scroll window, and double-click the left mouse button. Repeat this procedure for the 'v' variable. The data set attribute names 'u (4D)' and 'v (4D)' will appear in the red Data Panel above.

In order to display the data, select 'u (4D)' in the red Data Panel with the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. Do the same for the 'v (4D)' variable, *after first scrolling the Page Description Panel leftward to reveal a second red input text window in the picture description form. These actions will plot the two data sets by the Vector graphics method on the* VCS Canvas. (Because of the large size of the data sets, there may be a substantial wait time to view the display.) See also the Example on Creating Plots by Different Graphics Methods.

Step 2: Accessing the Vector Editor Panel

Scroll down the blue window of the Vector Graphics Method Panel and select 'example' with the left mouse button. The Vector Editor Panel will appear below. Scroll this Panel to the bottom, so that the 'ref_vector' input text window is visible.

Step 3: Changing the Line Attribute

To change the line attribute, access the (Tl) Line Table Panel (via Main Menu: 'Basic' - 'Line Table (Tl)'). Move the pointer over the cyan scroll window and select 'std' with the *middle* mouse button. Then move the pointer over the cyan input text window in the Vector Editor Panel and click the *middle* mouse button. The 'std' text string will replace the 'default' string. Select the red 'Apply' button to view the results on the VCS Canvas.

See also Hints on the Line Editor Panel for further details on changing line attributes.

Step 4: Changing the Vector Scale Value

To change the vector scale value, edit the 'vector_scale' input text window in the Vector Editor Panel, replacing the value '1' with a '5'. Select the red 'Apply' button to view the results on the VCS Canvas.

Step 5: Changing the Vector Alignment

To change the vector alignment (i.e., 'tail' - tail at point, 'center' - center at point, and 'head' - head at point), move the pointer over the 'vector_align' menu button and press and hold the left mouse button. Then move the pointer over the 'head' menu item and release the left mouse button. Select the red 'Apply' button to view the results on the VCS Canvas.

Step 6: Changing the Vector Type

To change the vector type (i.e., 'Arrow', 'Solid Arrow', and 'Wind Barbs'), move the pointer over the 'vector_type' menu button and press and hold the left mouse button. Then move the pointer over the 'Wind Barbs' menu item and release the left mouse button. Select the red 'Apply' button to view the results on the VCS Canvas.

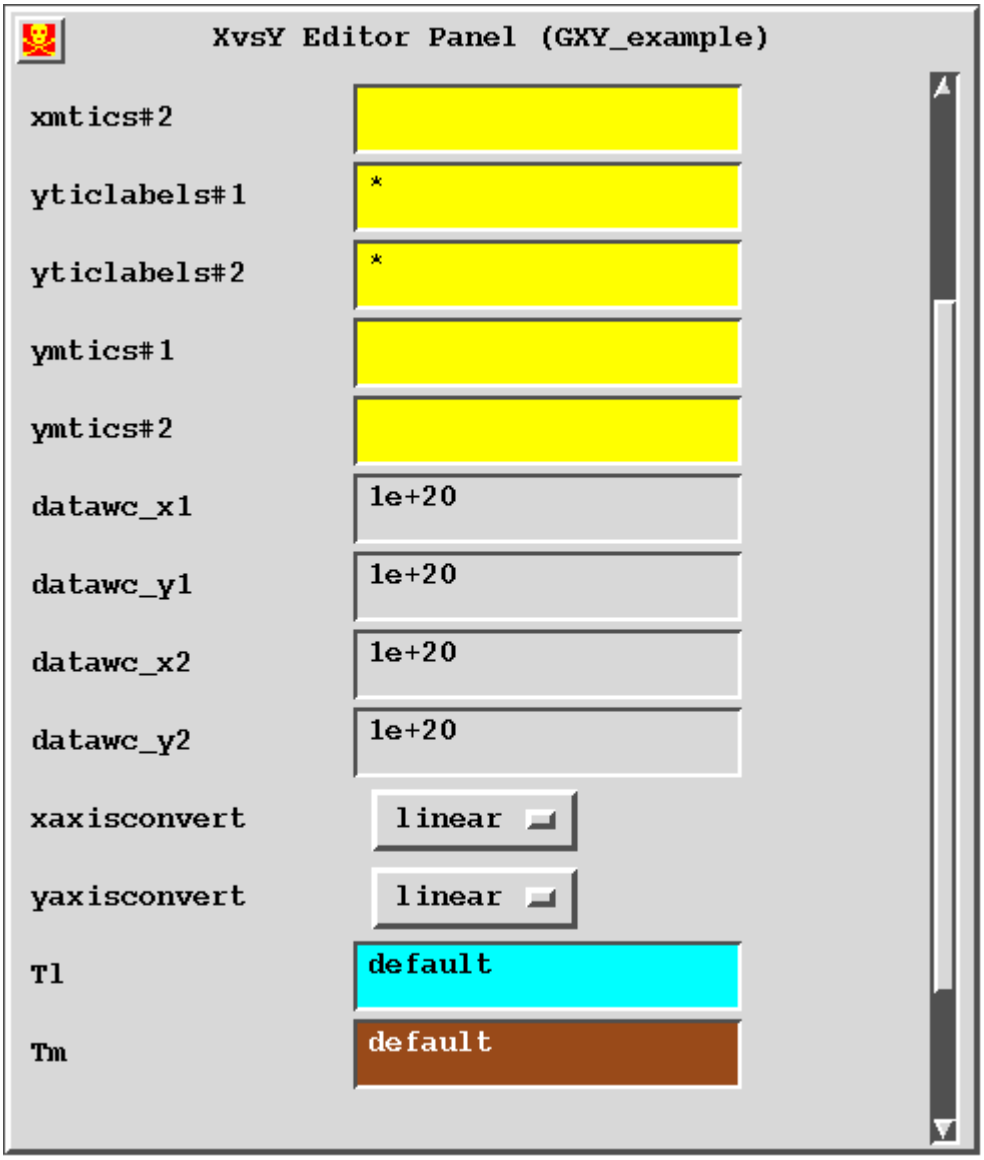
Step 7: Changing the Vector Reference

To change the vector reference that defines the size of the vector in response to the data, edit the 'ref_vector' input text window in the Vector Editor Panel by replacing the value '1.e+20' with '20'. Select the red 'Apply' button to view the results on the VCS Canvas.

Step 8: Thinning the Vector Data

Consult Hints on the Data Editor Panel and the Dimension Manipulation Panel for procedures to thin the u and v fields.

VCS Example: Modifying XvsY Attributes



Description

The XvsY graphics method displays a line plot from two 1D data arrays, that is X(t) and Y(t), where t represents the 1D coordinate values. This example shows how to change line and marker attributes for the XvsY graphics method.

Step 1: Displaying Data with the XvsY Graphics Method

Access the blue XvsY Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'XvsY'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, select the XvsY 'default' attribute set with the *middle* mouse button. Then move the pointer over the XvsY menu button and press and hold the left mouse button, select the 'Copy' menu item and release--a popup window will appear. Enter a new XvsY attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name will appear in the blue XvsY Graphics Method Panel. This is the XvsY attribute set that will be modified in this example.

Use this newly created XvsY attribute set name and the Template Panel's 'default' attribute set in the chosen picture descriptor form located in the Page Description Panel. Then select the ***example.nc*** file in the Data Selection Panel,

move the pointer over the 'u' variable in this Panel's 'Variables' scroll window, and double-click the left mouse button. Repeat this procedure for the 'v' variable. The data set attribute names 'u (4D)' and 'v (4D)' will appear in the red Data Panel above.

In order to display the data, select 'u (4D)' in the red Data Panel with the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. Do the same for the 'v (4d)' variable, *after first scrolling the Page Description Panel leftward to reveal a second red input text window in the picture description form. These actions will plot the two data sets by the XvsY graphics method on the* VCS Canvas. (Because of the large size of the data sets, there may be a substantial wait time to view the display.) See also the Example on Creating Plots by Different Graphics Methods.

Step 2: Accessing the XvsY Editor Panel

Scroll down the blue window of the XvsY Graphics Method Panel and select 'example' with the left mouse button. The XvsY Editor Panel will appear below. Scroll the panel to the bottom, so that the 'Tm' input text window is visible.

Step 3: Changing the Line Attribute

To change the line attribute, access the (Tl) Line Table Panel (via Main Menu: 'Basic' - 'Line Table (Tl)'). Move the pointer over the cyan scroll window and select 'std' with the *middle* mouse button. Then move the pointer over the cyan input text window in the XvsY Editor Panel and click the *middle* mouse button. The 'std' text string will replace the 'default' string. Select the red 'Apply' button to view the results on the VCS Canvas.

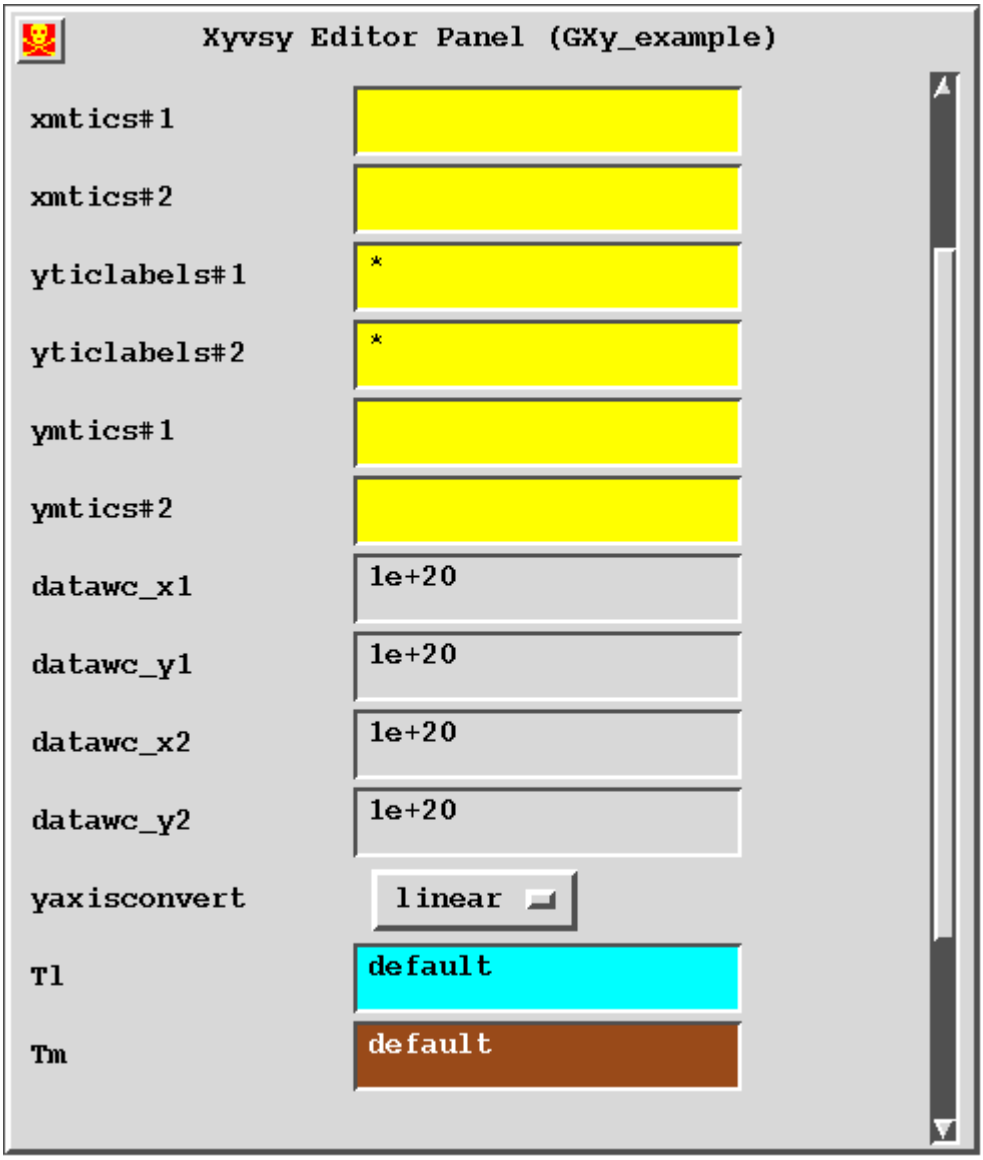
See also Hints on the Line Editor Panel for further details on changing line attributes.

Step 4: Changing the Marker Attribute

To change the marker attribute, access the (Tm) Marker Table Panel (via Main Menu: 'Basic' - 'Marker Table (Tm)'). Move the pointer over the brown scroll window and select 'red' with the *middle* mouse button. Then move the pointer over the brown 'Tm' input text window in the XvsY Editor Panel and click the *middle* mouse button. The 'red' text string will replace the 'default' string. Select the red 'Apply' button to view the results on the VCS Canvas.

See also Hints on the Marker Editor Panel for further details on changing marker attributes.

VCS Example: Modifying Xyvsy Attributes



Description

The Xyvsy graphics method displays a line plot from a 1D data array, i.e. a plot of X(y) where y represents the 1D coordinate values. This example shows how to change line and marker attributes for the Xyvsy graphics method.

Step 1: Displaying Data with the Xyvsy Graphics Method

Access the blue Xyvsy Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Xyvsy'). *Note, VCS does not allow the modification of 'default' attribute sets.* Therefore, select the Xyvsy 'default' attribute set with the *middle* mouse button. Then move the pointer over the Xyvsy menu button and press and hold the left mouse button. Select the 'Copy' menu item and release--a popup window will appear. Enter a new Xyvsy attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name will appear in the blue Xyvsy Graphics Method Panel. This is the Xyvsy attribute set that will be modified in this example.

Use this newly created Xyvsy attribute set name and the Template Panel's 'default' attribute set name in the chosen picture descriptor form located in the Page Description Panel. Select the ***example.nc*** file in the Data Selection Panel, move the pointer over the 'psl' variable in this Panel's 'Variables' scroll window, and double-click the left mouse

button. The data set attribute name 'psl (3D)' will appear in the red Data Panel above.

In order to display the data, select 'psl (3D)' in the red Data Panel with the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'psl (3D)' data by the Xyvsy graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods).

Step 2: Accessing the Xyvsy Editor Panel

Scroll down the blue window of the Xyvsy Graphics Method Panel and select 'example' with the left mouse button. The Xyvsy Editor Panel (see above figure) will appear below. Scroll the panel to the bottom, so that the 'Tm' input text window is in view.

Step 3: Changing the Line Attribute

To change the line attribute, access the (Tl) Line Table Panel (via Main Menu: 'Basic' - 'Line Table (Tl)'). Move the pointer over the cyan scroll window and select 'std' with the *middle* mouse button. Then move the pointer over the cyan input text window in the Xyvsy Editor Panel and click the *middle* mouse button. The 'std' text string will replace the 'default' string. Select the red 'Apply' button to view the results on the VCS Canvas.

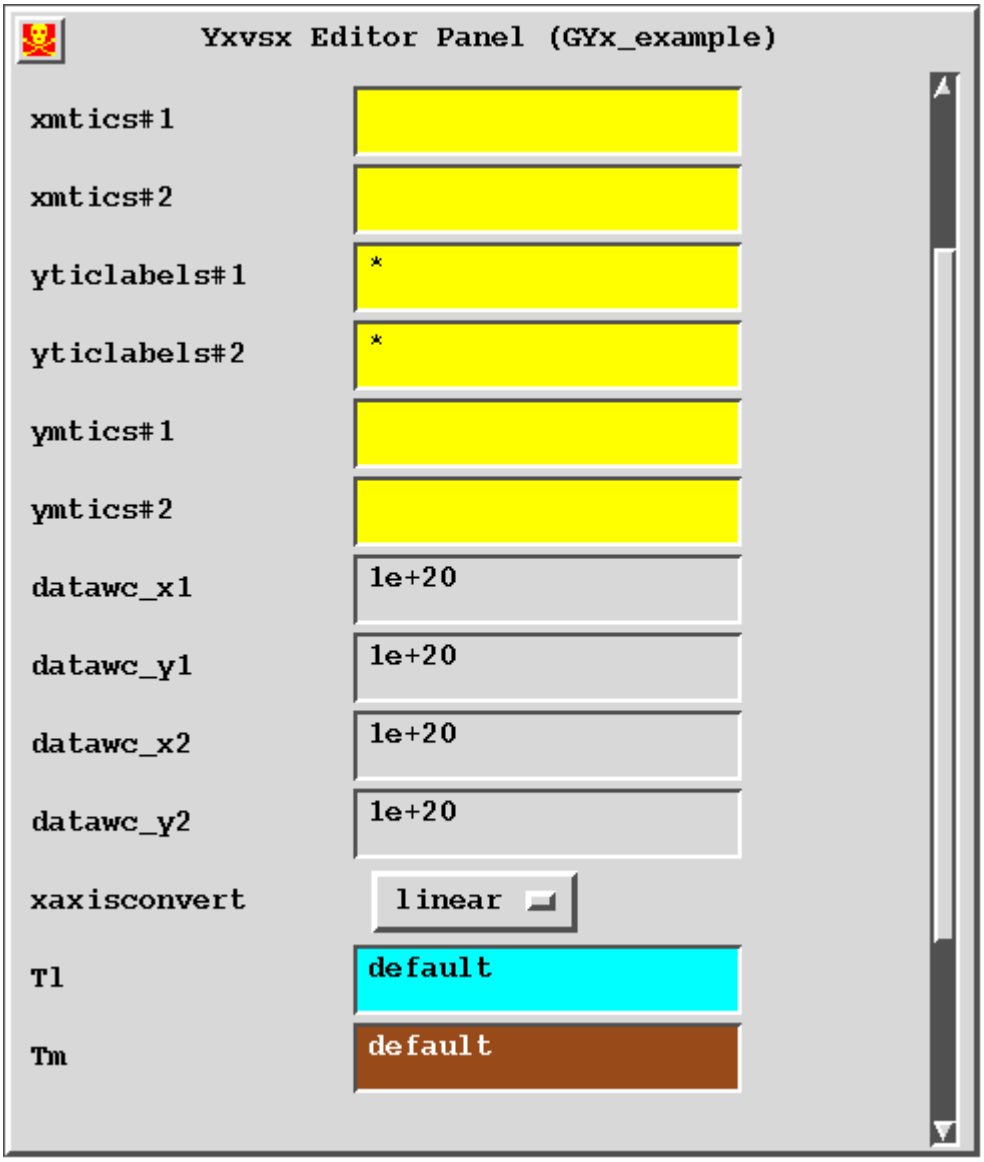
See also Hints on the Line Editor Panel for further details on changing line attributes.

Step 4: Changing the Marker Attribute

To change the marker attribute, access the (Tm) Marker Table Panel (via Main Menu: 'Basic' - 'Marker Table (Tm)'). Move the pointer over the brown scroll window and select 'red' with the *middle* mouse button. Then move the pointer over the brown 'Tm' input text window in the Xyvsy Editor Panel and click the *middle* mouse button. The 'red' text string will replace the 'default' string. Select the red 'Apply' button to view the results on the VCS Canvas.

See also Hints on the Marker Editor Panel for further details on changing marker attributes.

VCS Example: Modifying Yxvsx Attributes



Description

The Yxvsx graphics method displays a line plot from a 1D data array, i.e. a plot of Y(x) where x represents the 1D coordinate values. This example shows how to change line and marker attributes for the Yxvsx graphics method.

Step 1: Displaying Data with the Yxvsx Graphics Method

Access the blue Yxvsx Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Yxvsx'). *Note, VCS does not allow the modification of 'default' attribute sets.* Therefore, select the Yxvsx 'default' attribute set with the *middle* mouse button. Then move the pointer over the Yxvsx menu button and press and hold the left mouse button, select the 'Copy' menu item and release--a popup window will appear. Next, enter a new Yxvsx attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name will appear in the blue Yxvsx Graphics Method Panel. This is the Yxvsx attribute set that will be modified in this example.

Use this newly created 'Yxvsx' attribute set name and the Template Panel's 'default' attribute set name in the chosen picture descriptor form located in the Page Description Panel. Select the ***example.nc*** file in the Data Selection Panel,

move the poiner over the ‘psl’ variable in this Panel’s ‘Variables’ scroll window, and double-click the left mouse button. The data set attribute name ‘psl (3D)’ will appear in the red Data Panel above.

In order to display the data, select ‘psl (3D)’ in the red Data Panel with the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the ‘psl (3D)’ data by the Yxvsx graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods)

Step 2: Accessing the Yxvsx Editor Panel

Scroll down the blue Yxvsx Graphics Method Panel and select ‘example’. The Yxvsx Editor Panel (see above figure) will appear below. Scroll the panel to the bottom, so that the ‘Tm’ input text window is visible.

Step 3: Changing the Line Attribute

To change the line attribute, access the (Tl) Line Table Panel (via Main Menu: ‘Basic’ - ‘Line Table (Tl)’). Move the pointer over the cyan scroll window and select ‘std’ with the *middle* mouse button. Then move the pointer over the cyan input text window in the Yxvsx Editor Panel and click the *middle* mouse button. The ‘std’ text string will replace the ‘default’ string. Select the red ‘Apply’ button to view the results on the VCS Canvas.

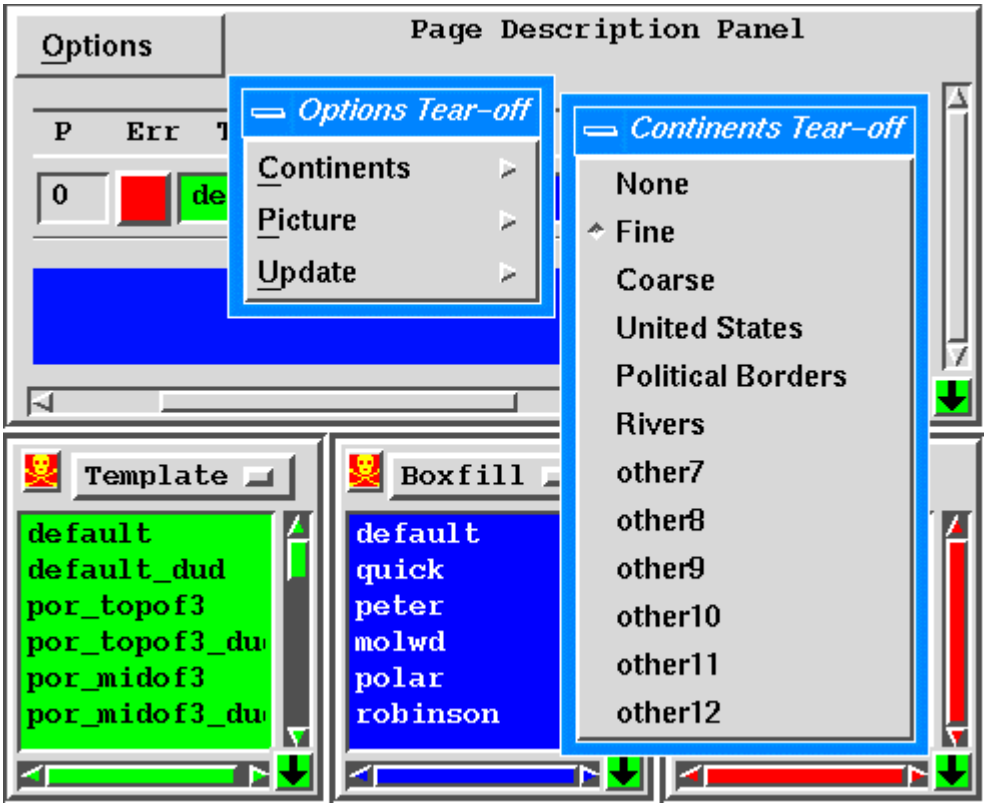
See also Hints on the Line Editor Panel for further details on changing line attributes.

Step 4: Changing the Marker Attribute

To change the marker attribute, access the (Tm) Marker Table Panel (via Main Menu: ‘Basic’ - ‘Marker Table (Tm)’). Move the pointer over the brown scroll window and select ‘red’ with the *middle* mouse button. Then move the pointer over the brown ‘Tm’ input text window in the Yxvsx Editor Panel and click the *middle* mouse button. The ‘red’ text string will replace the ‘default’ string. Select the red ‘Apply’ button to view the results on the VCS Canvas.

See also Hints on the Marker Editor Panel for further details on changing marker attributes.

VCS Example: Changing the Continental Outlines



Description

If data plotted on the VCS Canvas has 'longitude' and 'latitude' as the first and second dimensions, respectively, then continental outlines will be displayed along with the data. This example acquaints the user with procedures for selecting no continental outlines, two internal continental outline maps (i.e., "Fine Continents" and "Coarse Continents"), and three external continental outline maps (i.e., "United States", "Political Borders", and "Rivers").

Note, the continental outlines are changed via the Page Description Panel, not the Continents Editor Panel.

See also Setup Information on the Continents Mapping Options and Hints on the Page Description Panel.

Step 1: Specifying the Template, Graphics Method, and Data

In this example, use 'default' template and Isoline graphics method attribute sets in the chosen picture descriptor form on the Page Description Panel. (The template's 'default' attribute set is accessed via Main Menu: 'Primary' - 'Template Table'. The Isoline 'default' set is accessed via Main Menu: 'Primary' - 'Graphics Table' - 'Isoline'.)

Select the ***example.nc*** file in the Data Selection Panel. Then move the pointer over the 'tas' string in this Panel's 'Variables' scroll window and double-click the left mouse button. The data attribute name 'tas (3D)' will appear in the red Data Panel above.

In order to display the data, select 'tas (3D)' with the *middle* mouse button from the red Data Panel. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'tas (3D)' data by the Isoline graphics method on the VCS Canvas.

See also the Example on Creating Plots by Different Graphics Methods.

Step 2: Tearing Off the List of Continent Names

Move the pointer over the 'Options' pull down menu button located in the Page Description Panel (see above figure). Press and hold down the left mouse button. The menu items 'Continents', 'Picture', and 'Update' will appear. Move the pointer over the 'Continents' menu item and continue to hold down the left mouse button. A menu list of continent names (e.g., 'None', 'Fine', 'Coarse', etc.) will appear to the right. Move the pointer to the right over the dashed line located at the top of the list of continent names, and release the left mouse button. The list of menu continent names will remain on the screen.

Step 3: Selecting a Different Continential Outline

Select the 'None' menu item in the Continents Tear-Off popup window. The plot on the VCS Canvas will be redrawn with no continential outlines. Next, select the 'United States' menu item. The plot will be drawn with the states outlined.

Note: The external continent files (e.g., data_continent_states, data_continent_political, and data_continent_river) must be located in the user's

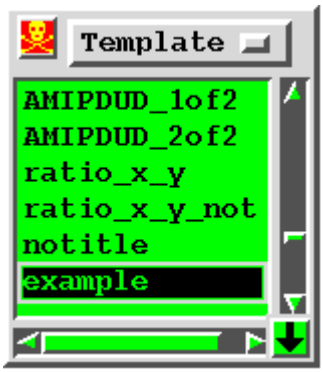
$HOME/PCMDI_GRAPHICS

directory. If VCS cannot find a specified external continents file, then it will use "Fine Continents" as the default.

Now, repeat Step 3, selecting other continent names.

See Setup Information on the Continents Mapping Options for information about adding additional user-defined external continents.

VCS Example: Modifying a Template



Description

The template determines the location of each picture segment, the space to be allocated to it, and related properties relevant to its display. This example shows how to modify the template by use of the Template Panel, the Template Browser Panel, the Template Text Editor Panel, and the Overall Modification Panel.

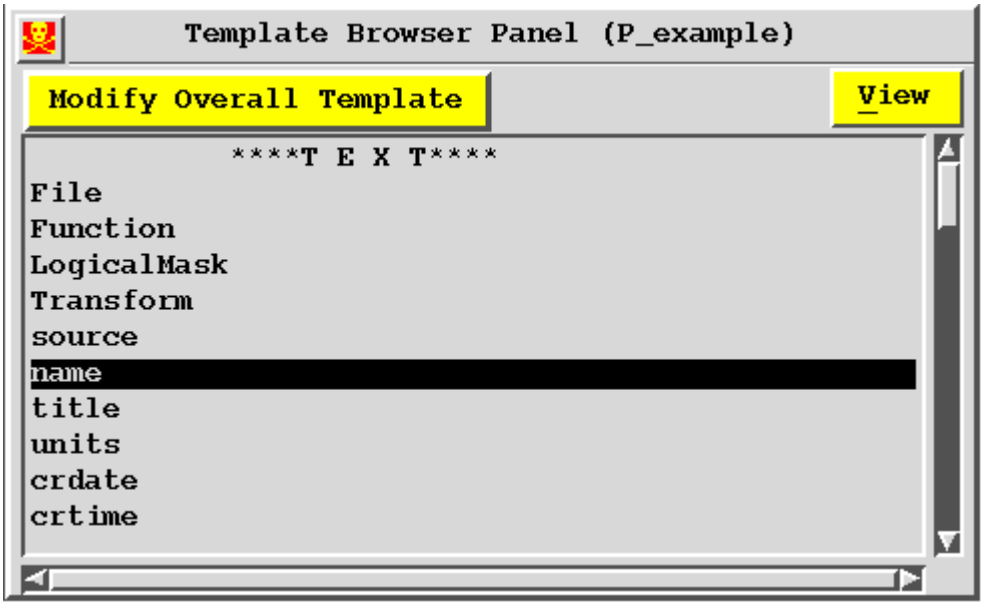
Step 1: Specifying the Template, Isoline Graphics Method, and Data

VCS does not allow the modification of 'default' attribute sets. Therefore, select the 'default' attribute set on the green Template Panel with the *middle* mouse button . (The Template Panel is accessed via Main Menu: 'Primary' - 'Template Table'.) Move the pointer over the Template Panel's menu button and press and hold the left mouse button. Then move the pointer over the 'Copy' item and release--a popup window will appear. Enter a new attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name will appear in the green Template Panel. This is the new template attribute set that will be modified in this example.

Use this newly created template attribute set name and the Isoline attribute set name 'default' in the chosen picture descriptor form located in the Page Description Panel. (The Isoline Graphics Method Panel is accessed via Main

Menu: 'Primary' - 'Graphics Table' - 'Isoline'.) Select the ***example.nc*** file in the Data Selection Panel, move the pointer over the 'psl' variable in this Panel's 'Variables' scroll window, and double-click the left mouse button. The data set attribute name 'psl (3D)' then will be displayed in the red Data Panel above.

In order to display the data, select the string 'psl (3D)' in the red Data Panel with the *middle* mouse button. Then move the pointer to the chosen red input text window of the picture descriptor form and click the *middle* mouse button. This action will plot the 'psl (3D)' data by the Isoline graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods.)



Step 2: Accessing the Template Browser Panel

Scroll down the green window of the Template Panel and select the 'example' string. (If 'example' is selected with the *middle* mouse button, VCS will copy 'example' into its copy buffer; if 'example is selected with the *right* mouse button, VCS will delete 'example' from the list.) The Template Browser Panel will appear below.

Step 3: Showing Rulers

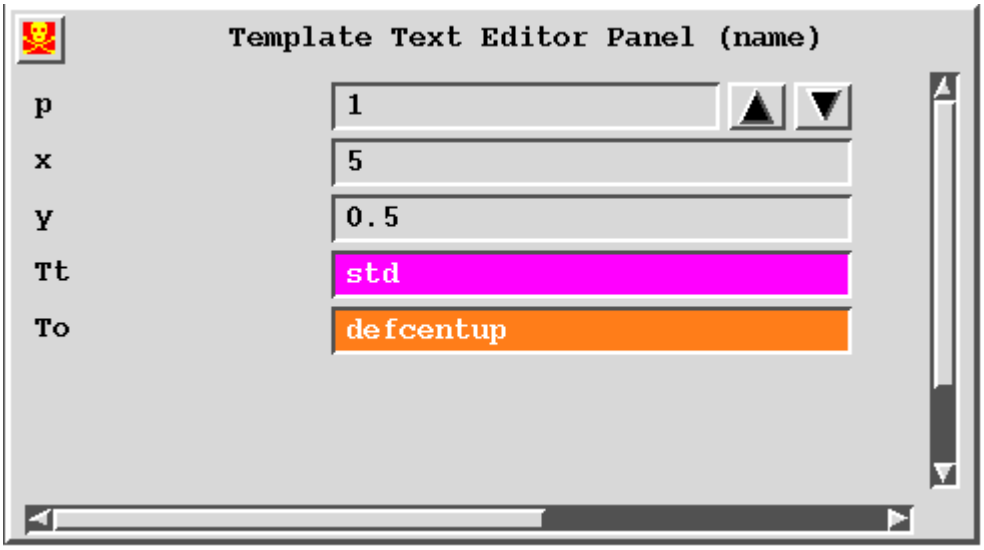
Move the pointer over the yellow 'View' menu button and press and holding the left mouse button. Then move the pointer over the 'Rulers' menu item and release the left mouse button. Rulers will appear above and to the left of the VCS Canvas. (The Canvas represents the size of a page: 8.5 X 11 in or 21.59 X 27.94 cm for a 'landscape' setting and 11 X 8.5 in or 27.94 X 21.59 cm for a 'portrait' setting.)

Step 4: Showing Grid Lines

Move the pointer over the yellow 'View' menu button on the Template Browser Panel and press and hold the left mouse button. Then move the pointer over the 'Grid' menu item and release the left mouse button. Grid lines will appear at inch or centimeter intervals (see below) on the VCS Canvas.

Step 5: Displaying Rulers and Grid in Centimeters vs Inches

Move the pointer over the yellow 'View' menu button on the Template Browser Panel and press and hold the left mouse button. Then move the pointer over the 'Cm' menu item and release the left mouse button. The rulers and grid lines will display at centimeter intervals. Next, move the pointer over the 'Inch' menu item and release the left mouse button. The rulers and grid lines will revert to displaying at inch intervals.



Step 6: Moving Segments on the VCS Canvas

Select with the left mouse button the 'name' template text attribute on the Template Browser Panel. The Template Text Editor Panel will appear below. A red button with a black dot also will appear on the VCS Canvas. Position the pointer over this red button and press and hold the left mouse button. Then move the red button to another location on the screen and release the left mouse button. The 'name' attribute ('psl') will appear in the new location. When moving the red button, note the markers on the rulers which facilitate placement of the graphic segment in the desired location.

A template segment also can be moved using the Template Text Editor Panel as follows. Edit the 'x' input text window (e.g., '5') and the 'y' input text window (e.g., '0.5'); these values specify the position of the template's upper left corner in inches or centimeters. Then select the red 'Apply' button to view the results on the VCS Canvas.

Step 7: Changing the Text Type

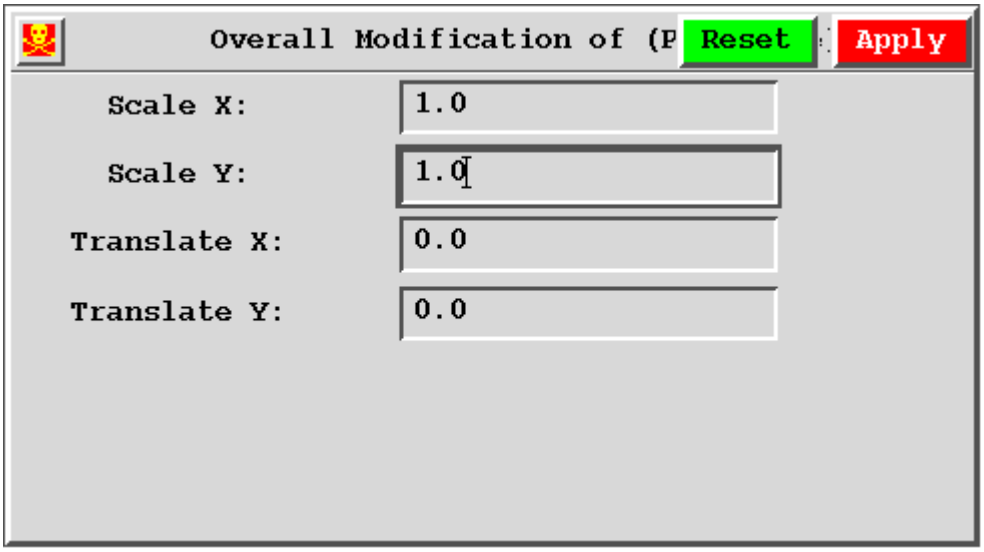
To specify the text type, access the (Tt) Text Table Panel(via Main Menu: 'Basic' - 'Text Table (Tt) and (To)'). Move the pointer over the magenta '(Tt)' scroll window and select 'std' with the *middle* mouse button. Then move the pointer to the Template Text Editor Panel's magenta 'Tt' input text window and click the *middle* mouse button. The 'default' text string will be replaced by the 'std' text string. Select the red 'Apply' button to view the results on the VCS Canvas.

Step 8: Changing the Text Orientation

To specify the text orientation, access the (To) Text Orientation Table Panel (via Main Menu:, 'Basic' - 'Text Table (Tt) and (To)'). Move the pointer over the orange '(To)' scroll window and select 'defcentup' with the *middle* mouse button. Then move the pointer to the Template Text Editor Panel's orange 'Tt' input text window and click the *middle* mouse button. The 'default' text string will be replaced by the 'defcentup' text string. Select the red 'Apply' button to view the results on the VCS Canvas.

Step 9: Removing the Template Text Editor Panel and Associated Red Button

Select the 'skull and crossbones' icon in the upper left corner of the Template Text Editor Panel. The Panel will be removed, as will the associated red button on the VCS Canvas.



Step 10: Scaling and Translating the Overall Template

Select the yellow 'Modify Overall Template' rectangle on the Template Browser Panel--the Overall Modification Panel will appear below. In addition, eight red buttons with an interconnecting box will appear on the VCS Canvas. Position the pointer over the red 'BR' button (i.e., the *bottom right* corner of the box), and press and hold the left mouse button. Then move the 'BR' button so that the box connecting the red buttons is reduced in size--the template will adjust to this new box size.

To maintain the template's aspect ratio, edit the 'Scale X' and 'Scale Y' input text windows on the Overall Modification Panel. (For example, identical entries of '0.5' for 'Scale X' and 'Scale Y' will shrink the template's dimensions by a factor of 2; conversely, identical entries of '2.0' will double the template's dimensions.) Select the red 'Apply' button to view the results on the VCS Canvas.

To translate the overall template, position the pointer anywhere within the box connecting the red buttons on the VCS Canvas, and press and hold the left mouse button. Then move the pointer to another location on the Canvas and release the left mouse button. The template will be redrawn in this new location.

To fine-tune the position of the overall template, edit the 'Translate X' and Translate Y' input text windows on the Overall Modification Panel, which specify the X and Y positions of the template's upper left corner. (The values entered may be expressed either in inches or centimeters.) Select the red 'Apply' button to view the results on the VCS Canvas.

See also Hints on the Template Panel and the Template Browser Panel for further details.

VCS Example: Modifying a Format

Description

This example shows how to modify the VCS secondary element denoted as *format*. A different format is assigned for each set of variables that are defined by name and units. Examples of variables for which format is relevant include

- the single-valued dimensions of array data, which use the dimension name and units descriptors
- the mean, maximum, and minimum of the array data variable, which are named 'mean', 'max', and 'min', respectively, and whose units are the same as those of the variable

Format attributes include: the *format*, a description of how to format the associated variable(s); the *name* of the

variable(s) using the format; and the *units* of the variable(s) using the format. *Note: The units attribute can be specifed with an asterisk (*) when it is intended that the variables using the format have different units.*

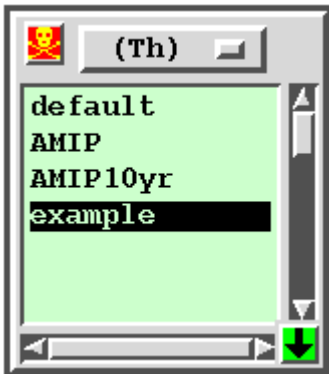
Step 1: Specifying the Template, Isofill Graphics Method, and Data

VCS does not allow the modification of 'default' attribute sets. Therefore, select the 'default' attribute set on the green Template Panel with the *middle* mouse button. (The Template Panel is accessed via Main Menu: 'Primary' - 'Template Table'.) Move the pointer over the Template Panel's menu button and press and hold the left mouse button. Then move the pointer over the 'Copy' item and release--a popup window will appear. Enter a new attribute set name (e.g., 'example') and select the 'Save' button--the 'example' attribute set name will appear in the green Template Panel. This is the new template attribute set that will be modified in this example.

Use this newly created template attribute set name and the Isofill attribute set name 'default' in the chosen picture descriptor form located in the Page Description Panel. (The Isofill Graphics Method Panel is accessed via Main Menu: 'Primary' - 'Graphics Table' - 'Isofill'.) Select the ***example.nc*** file in the Data Selection Panel, move the pointer over the 'psl' variable in this Panel's 'Variables' scroll window, and double-click the left mouse button. The data set attribute name 'psl (3D)' then will be seen in the red Data Panel.

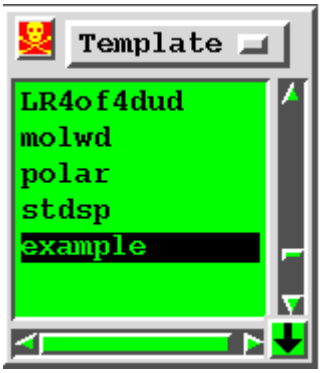
In order to display the data, select the string 'psl (3D)' in the red Data Panel with the *middle* mouse button. Then move the pointer to the chosen red input text window of the picture descriptor form and click the *middle* mouse button. This action will plot the 'psl (3D)' data by the Isofill graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods.)

Step 2: Accessing the Format Table Panel and Creating a Format

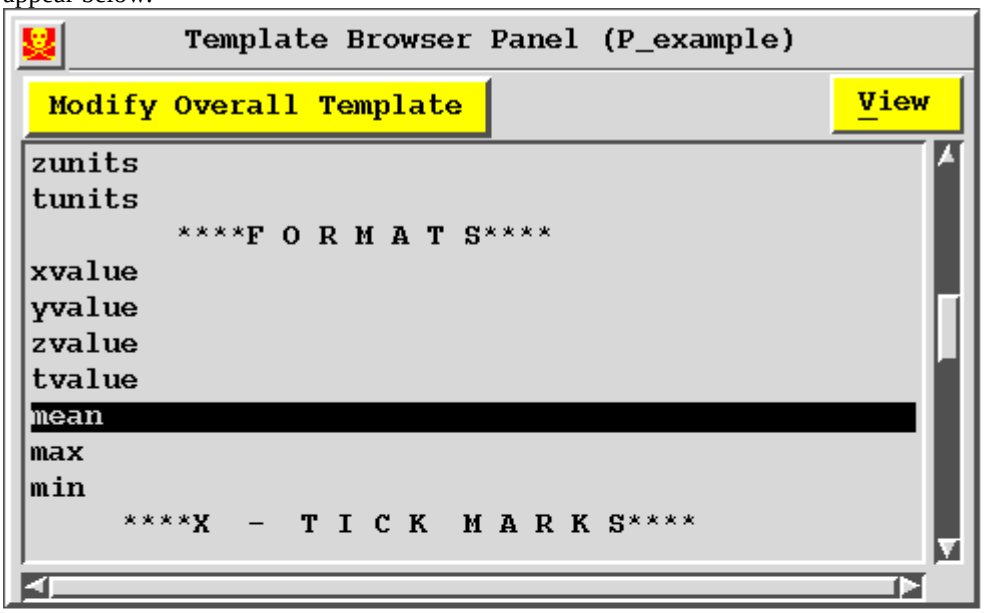


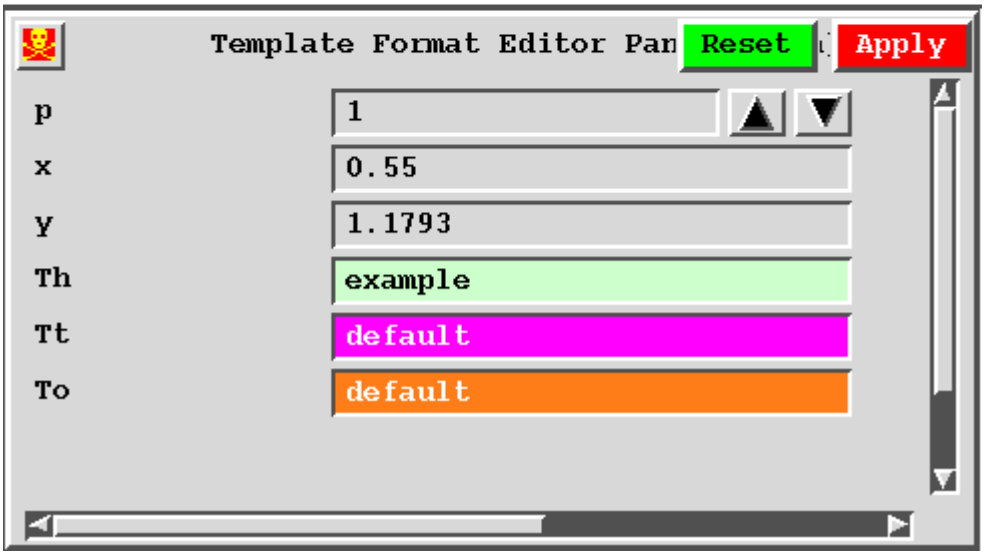
The light green (Th) Format Table Panel is accessed via Main Menu: 'Basic' - 'Format Table (Th)'. Select the 'default' attribute set on this Panel with the *middle* mouse button. Then move the pointer over the (Th) menu button and press and hold the left mouse button. Next, move the pointer over the 'Copy' item and release--a popup window will appear. Enter a new attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name will appear in the (Th) Format Table Panel. This is the new format attribute set that will be modified in this example.

Step 3: Accessing the Template Browser Panel and Template Format Editor Panel



Scroll down the green window of the Template Panel and select the 'example' string with the left mouse button. (If 'example' is selected with the *middle* mouse button, VCS will copy 'example' into its copy buffer; if 'example is selected with the *right* mouse button, VCS will delete 'example' from the list.) The Template Browser Panel will appear below.





Scroll down the Template Browser Panel until the

F O R T M A T S*

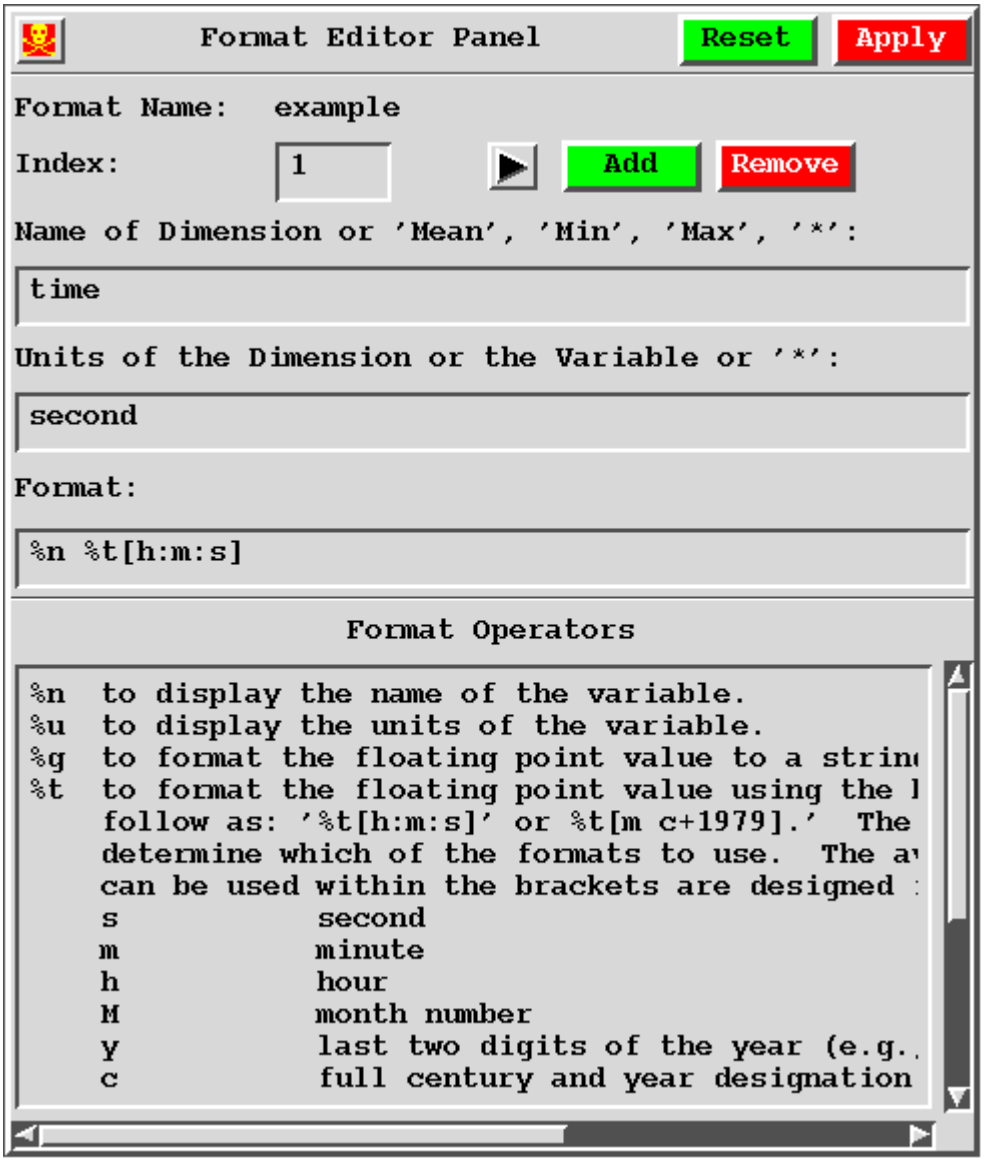
section appears. Then select the ‘mean’ string with the left mouse button. The Template Format Editor Panel (mean) will appear.

Step 4: Using the Created Format

Move the pointer over the ‘example’ string in the light green (Th) Format Table Panel and press and release the *middle* mouse button. VCS will copy the ‘example’ format string into its copy buffer. Next, move the pointer over the Template Format Editor Panel’s light green "Th" input text window, and press and release the *middle* mouse button. The ’example’ string will replace the ’default’ string. Select the red ‘Apply’ button in the upper right corner of this Panel to register this change.

Step 5: Accessing and Using the Format Editor Panel

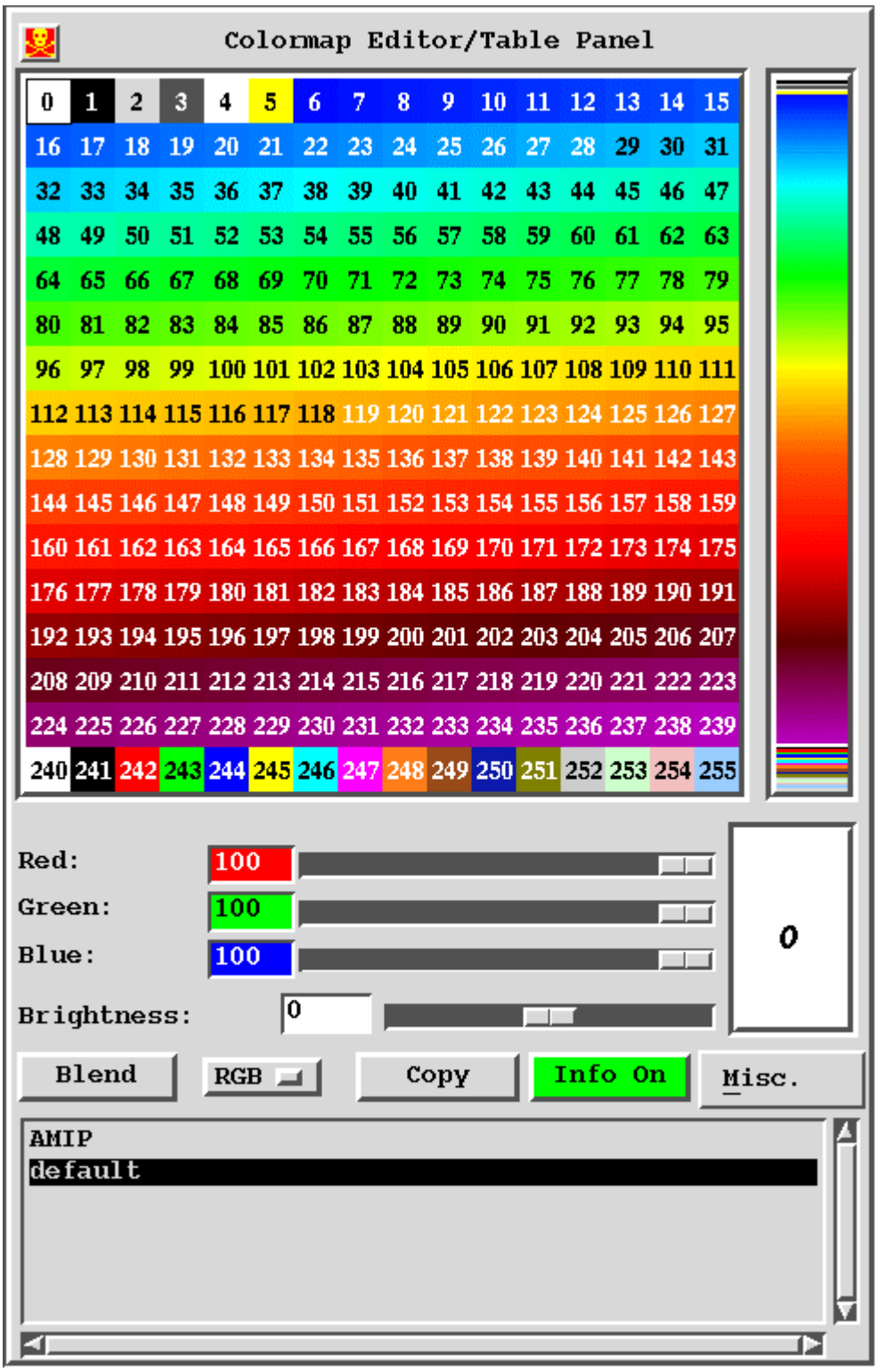
Move the pointer over the ‘example’ string in the light green (Th) Format Table Panel and press and release the left mouse button. The Format Editor Panel will appear below.



Next, move the pointer over the 'Index' right arrow on the Format Editor Panel, and press and release the left mouse button until the string 'mean' appears in the 'Name of Dimension or ....' input text window. View the 'Format Operators' in the scroll window at the bottom of this Panel. Then edit the 'Format' input text window that is currently displaying '%n %g' by removing the '%g'. Next, select the red 'Apply' button in the upper right corner of this Panel to register the change, which causes the 'mean' value on the plot to disappear.

Now repeat Steps 1 through 5 for a different format attribute set.

VCS Example: Creating and Modifying Colormaps



Description

The Colormap Editor/Table Panel is used to create and modify colormaps. There are 256 colors and color indices, but only the first 240 color indices can be modified (indices 240 through 255 being reserved for VCS internal use).

This example shows how to create and manipulate a colormap.

Step 1: Specifying Template, Graphics Method, and Data

In this example, use the Boxfill graphics method (accessed via Main Menu: 'Primary' - 'Graphics Table' - 'Boxfill'). Specify the Boxfill 'default' attribute set name in the blue input text window of the picture descriptor form on the Page Description Panel. Also specify the 'default' template attribute set name (accessed via Main Menu: 'Primary' - 'Template Table') in the green window of the picture descriptor form. Select the ***example.nc*** data file in the Data Selection Panel; then move the pointer over the 'tas' variable in this Panel's 'Variables' scroll window and double-click the left mouse button. The data set attribute name 'tas (3D)' will be displayed in the red above.

In order to display the data, select 'tas (3D)' in the red Data Panel with the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form on the Page Description Panel and click the *middle* mouse button. The 'tas (3D)' data will be plotted by the Boxfill graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods).

Step 2: Specifying the Colormap

Access the Colormap Editor/Table Panel (via Main Menu: 'Basic' - 'Colormap Editor/Table'). *Note, VCS does not allow the modification of 'default' attribute sets.* Therefore, scroll down the window at the bottom of the Colormap Editor/Table Panel until the attribute set name 'default' is visible, and select this name. Then move the pointer over the 'Copy' button (located above the scroll window), pressing and releasing the left mouse button--a popup window will appear. Enter a new colormap attribute set name (e.g., 'example') and select the 'Copy' button. The 'example' attribute set name will appear in the scroll window. This is the new colormap attribute set that will be modified in this example.

Step 3: Modifying a Color Index

On the Colormap Editor/Table Panel, select color index '200' with the left mouse button. The corresponding color will appear in the area below the colorbar, where the 'Red', 'Green', and 'Blue' color sliders reflect the appropriate color values. Move each color slider button to a new position by dragging it with the left mouse button. When modifying a color index (e.g., '200') in this way, the color area below the colorbar, the color index, and the data values using index '200' (displayed on the VCS Canvas) all change dynamically. To restore the color index to its original 'Red', 'Green', and 'Blue' values, move the pointer to the color area below the colorbar, and click the left mouse button.

Step 4: Obtaining Data Information from the Colormap

When selecting a color index in the Colormap Editor/Table Panel, the data range is displayed in the Message Panel. As an exercise, select color index '200', then look at the Message Panel (located below the Main Menu on the VCS Interface). The following string is displayed: 'Info - display_0, Boxfill, color 200 Data Range: (22.07, 22.41)'. This string includes, respectively, the page description form ID--'display_0', the graphics method--'Boxfill', the color index selected--'200', and the data range--'(22.07,22.42)'. *Note, this data information is only displayed for the Boxfill graphics method. To turn off this information display, toggle the 'Info On' button that is located below the color area on the* Colormap Editor/Table Panel

Step 5: Changing the Color Model

There are currently two color models available in VCS: the RGB (Red-Green-Blue) and the CMY (Cyan-Magenta-Yellow) color models. To change from the RGB color model to CMY, move the pointer to the 'RGB' menu button (located below the 'Brightness' input text window on the Colormap Editor/Table Panel). Press and hold down the left mouse button, then move the pointer over the 'CMY' menu item and release the left mouse button. Note that the 'Red', 'Green', and 'Blue' labels are replaced by 'Cyan', 'Magenta', and 'Yellow' respectively.

Step 6: Blending Colors

Colors can readily be blended in VCS. For example, select color index '200'; then, by moving all three color sliders to the extreme right, change its color to black (see above figure). Next, select color index '239' with the *middle* mouse button; by moving all three color sliders to the extreme left, change its color to white. Then select the 'Blend' button. The color range from indices '200' to '239' becomes a greyscale that varies between black and white.

Step 7: Copying and Pasting Color Indices

On the Colormap Editor/Table Panel, select color index '24' with the *left* mouse button. Then select color index '63' with the *middle* mouse button. Next, move the pointer to color index '200' and press the *right* mouse button. The color range from indices '24' through '63' replaces that from '200' through '239'.

Next, select color index '239' with the *left* mouse button. Then select color index '16' with the *middle* mouse button. Next, move the pointer again over color index '16', but select it with the *right* mouse button--the colormap flips.

Step 8: Brightening or Darkening the Colormap

Move the pointer over the 'Brightness' slider button on the Colormap Editor/Table Panel. Press and hold the left mouse button, moving the slider button to the left--the colormap darkens. Move the 'Brightness' slider button rightward to brighten the colormap.

Step 9: Applying Colormap Changes

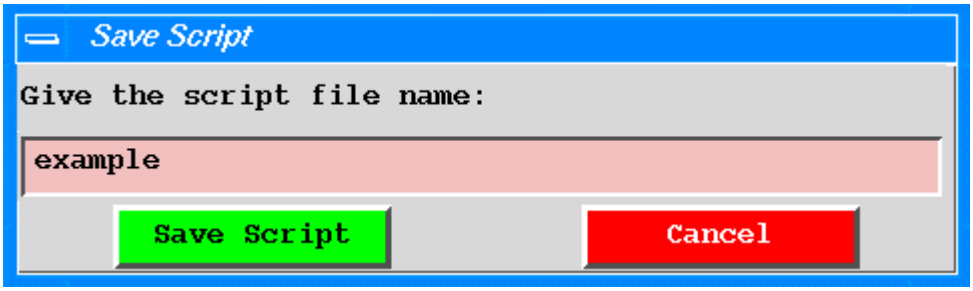
To apply the changes made to the colormap, select the red 'Apply' button at the top of the Colormap Editor/Table Panel. View the results on the VCS Canvas

Step 10: Deleting a Colormap

Select the colormap name 'example' in the scroll window at the bottom of the Colormap Editor/Table Panel. Delete this colormap by moving the pointer over the 'Misc.' pulldown menu and pressing and holding the left mouse button. While continuing to hold down the left mouse button, move the pointer over the 'Delete' menu item, then release the left mouse button.

See also Hints on the Colormap Editor/Table Panel.

VCS Example: Saving Individual Attribute Sets as Scripts



Description

This example shows how to save individual attributes sets (i.e., individual primary elements and/or secondary elements). These attribute sets are saved in the user's ***$HOME/PCMDI_GRAPHICS*** directory. *Note, because VCS does not allow the modification of 'default' attribute sets, it will not allow them to be saved as individual script files. As shown below, however, a 'default' attribute set that has been copied under a different name can be saved as a script file.*

Step 1: Accessing the Template Panel

The Template Panel is accessed via Main Menu: 'Primary' - 'Template Table'. Select the 'default' attribute set on the green Template Panel with the *middle* mouse button. Then move the pointer over the Template Panel's menu button and press and hold the left mouse button. Next, move the pointer over the 'Copy' menu item and release--a popup window will appear. Enter a new attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set name will appear in the green Template Panel. This is the new template attribute set that will be saved as a script file.

Step 2: Saving the Template Attribute Set

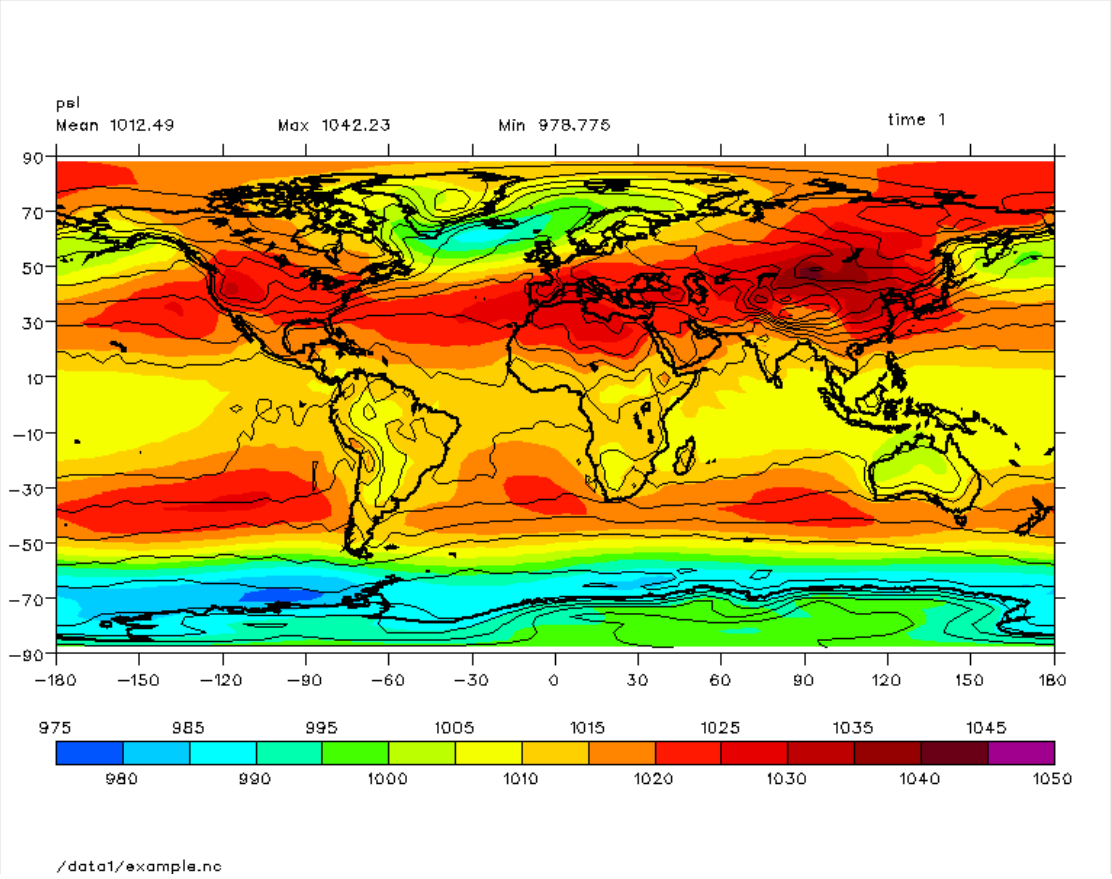
Move the pointer over the Template Panel's menu button and press and hold the left mouse button. Then move the pointer over the 'Script' menu item and release--a popup window will appear. Next, move the pointer over the popup window and enter the name of the script file to be saved (e.g., 'example'). Select the 'Save Script' button to save the template attribute set to the script file, or select the 'Cancel' button to abort the save. *Note, the file extension '.scr' will automatically be appended to the end of the script output name* (e.g., in this case, file ***example.scr*** will be found in the user's ***$HOME/PCMDI_GRAPHICS*** directory).

Step 3: Viewing the Script File

Bring up an 'xterm' window and change the directory to ***$HOME/PCMDI_GRAPHICS***. Then view the contents of the newly created script file (e.g., ***example.scr***) with an editor such as **vi** or **emacs**.

Repeat 'Step 2' with another attribute set and save it to the same file (e.g., **example.scr**). The script of this second attribute set will be appended to that of the first attribute set in this file.

VCS Example: Overlaying Graphics Methods



Description

This example shows how to overlay plots that are generated by different graphics methods. For illustration here, plots generated by the Isofill and the Isoline graphics methods will be overlaid. (The Isofill method fills the area between selected levels of constant value of a two-dimensional array with a user-specified color; the Isoline method draws lines of constant value at specified levels in a two-dimensional array.)

Step 1: Displaying Data with the Isofill Graphics Method

Access the blue Isofill Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Isofill'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, move the pointer over the Isofill 'default' attribute set name and click the *middle* mouse button. Next move the pointer over the Isofill menu button, and press and hold the left mouse button. Then move over the 'Copy' item and release the left mouse button--a popup window will appear. Enter a new Isofill attribute set name (e.g., 'example'), and select the 'Save' button. The 'example' attribute set name will appear in the blue Isofill Graphics Method Panel. This is the new 'Isofill' attribute set that will be utilized in this example.

Use this newly created 'Isofill' attribute set name and the Template Panel's 'default' attribute set name in the chosen picture descriptor form located in Page Description Panel. Move the pointer over the ***example.nc*** file in the Data Selection Panel, and click the left mouse button. Then move the pointer over the 'psl' variable in this Panel's 'Variables' scroll window and double-click the left mouse button. The data set attribute name 'psl (3D)' will appear in the red Data Panel above.

In order to display the data, move the pointer over 'psl (3D)' in the red Data Panel, and click the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'psl (3D)' data with the Isofill graphics method on the VCS Canvas. (See the Example on Modifying Isofill Attributes).

Step 2: Overlaying Data with the Isoline Graphics Method

Access the blue Isoline Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Isoline'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, move the pointer to the Isolevel 'default' attribute set name and click the *middle* mouse button. Next move the pointer over the 'Isoline' menu button, and press and hold the left mouse button. Then move over the 'Copy' item and release the left mouse button--a popup window will appear. Enter a new 'Isoline' attribute set name (e.g., 'example') and select the 'Save' button. The 'example' attribute set will appear in the blue Isoline Graphics Method Panel. This is the new Isoline attribute set that will be utilized in this example.

Create a new picture descriptor form, in the Page Description Panel, and use this newly created Isoline attribute set and the Template Panel's 'default_dud' attribute set in the newly created picture descriptor form. Move the pointer over the ***example.nc*** file in the Data Selection Panel and click the left mouse button. Then move the pointer over the 'tas' variable in this Panel's 'Variables' scroll window and double-click the left mouse button. The data set attribute name 'tas (3D)' will appear in the red Data Panel above.

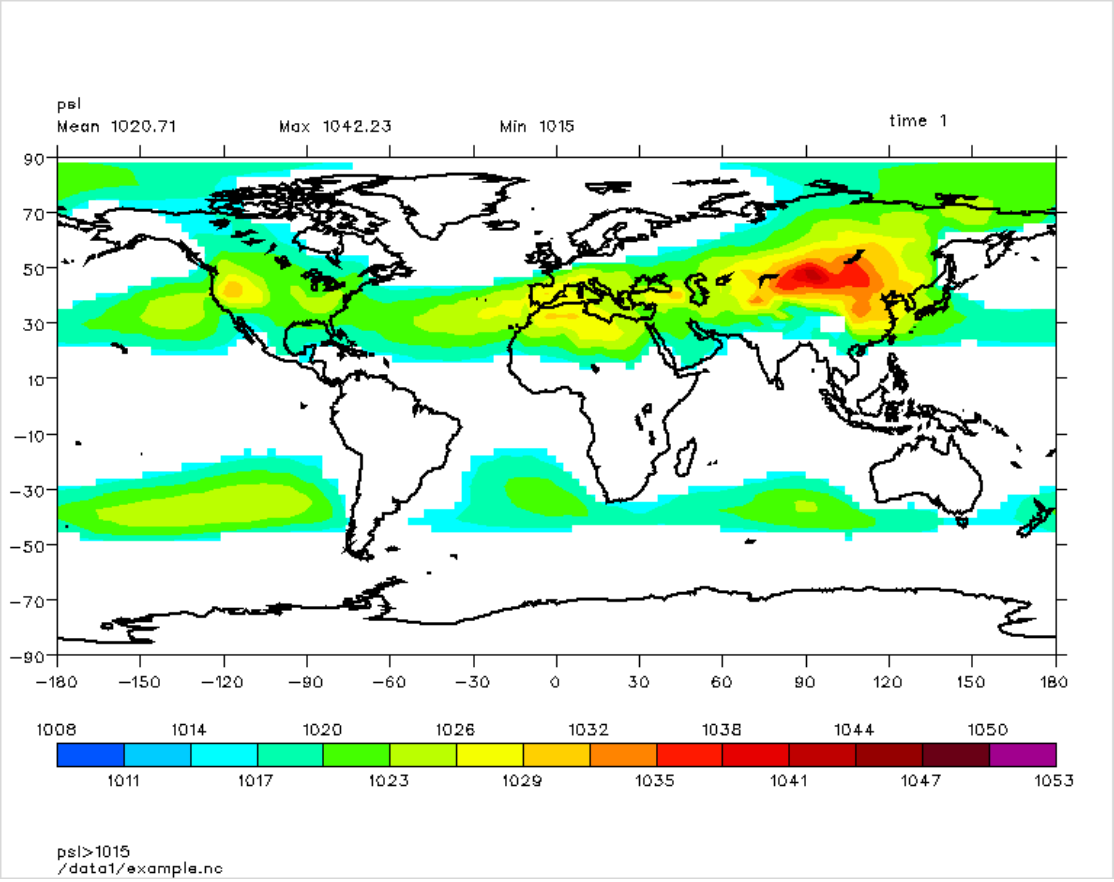
In order to display the data, select 'tas (3D)' with the *middle* mouse button in the red Data Panel. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'tas (3D)' data with the Isoline graphics method on the VCS Canvas. (See also the Example on Modifying Isoline Attributes).

Step 3: Changing the Priority of the Plots

In the Page Description Panel, the picture descriptor form with the highest priority number displays its plot on top of all others. Change the priority of the Isofill plot (i.e., the first picture descriptor form) by selecting the 'P' input text window with the left mouse button. Replace its priority number of '0' with '1', and hit the 'Return' or 'Enter' key. The Isoline plot will be drawn first followed by the overlaid Isofill plot.

Now follow the same procedure above to change the priority number of the Isoline plot (i.e., the second picture descriptor form) from '0' to '2'. The Isofill plot will be drawn first followed by the overlaid Isoline plot.

VCS Example: Defining a Logical Mask



Description

This example shows how to use the VCS Logical Mask function to mask out node points. By default, the absolute value of any data value greater than or equal to 10**20 is masked out in VCS. Beginning with Version 2.6, the masking option has been extended so that a logical 'and' operation is performed on the assigned mask value M and 10**20, allowing masking when specified criteria are satisfied. These criteria may be defined by 5 operators: greater than (), less than (<), equal (=), greater than or equal (=), and less than or equal (<=).

Step 1: Displaying Data with the Isofill Graphics Method

Access the blue Isofill Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Isofill'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, move the pointer over the Isofill 'default' attribute set name and click the *middle* mouse button. Next move the pointer over the Isofill menu button, and press and hold the left mouse button. Then move over the 'Copy' item and release the left mouse button--a popup window will appear. Enter a new Isofill attribute set name (e.g., 'example'), and select the 'Save' button. The 'example'

attribute set name will appear in the blue Isofill Graphics Method Panel. This is the new 'Isofill' attribute set that will be utilized in this example.

Use this newly created 'Isofill' attribute set name and the Template Panel's 'default' attribute set name in the chosen picture descriptor form located in Page Description Panel. Move the pointer over the ***example.nc*** file in the Data Selection Panel, and click the left mouse button. Then move the pointer over the 'psl' variable in this Panel's 'Variables' scroll window and double-click the left mouse button. The data set attribute name 'psl (3D)' will appear in the red Data Panel above.

In order to display the data, move the pointer over 'psl (3D)' in the red Data Panel, and click the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'psl (3D)' data with the Isofill graphics method on the VCS Canvas. (See the Example on Modifying Isofill Attributes).

Step 2: Accessing the Data Editor Panel in Defined Mode

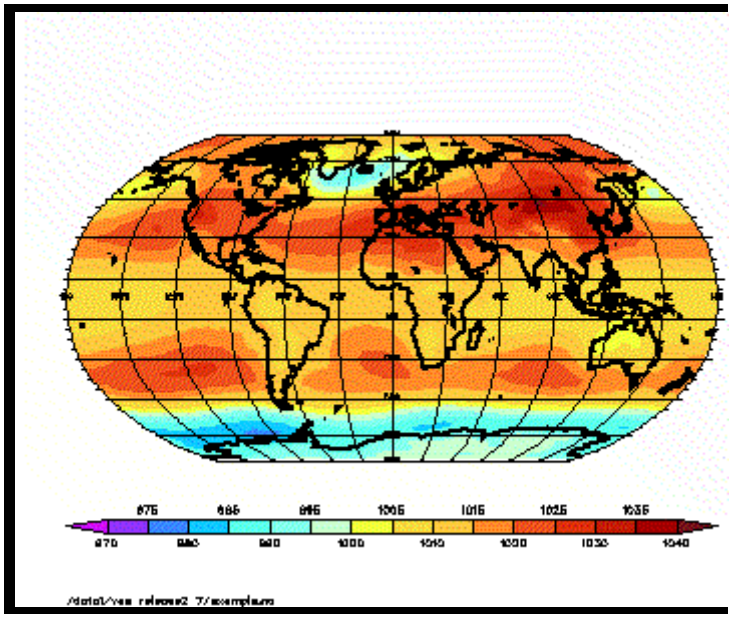
Move the pointer over the displayed data attribute set name (i.e., 'psl (3D)') in the red Data Panel and click the left mouse button. The Data Editor Panel '(A_psl)' will appear below. Move the pointer over the 'Defined' toggle button (at the top of the Data Editor Panel) and click the left mouse button--the defined data attribute set will be shown.

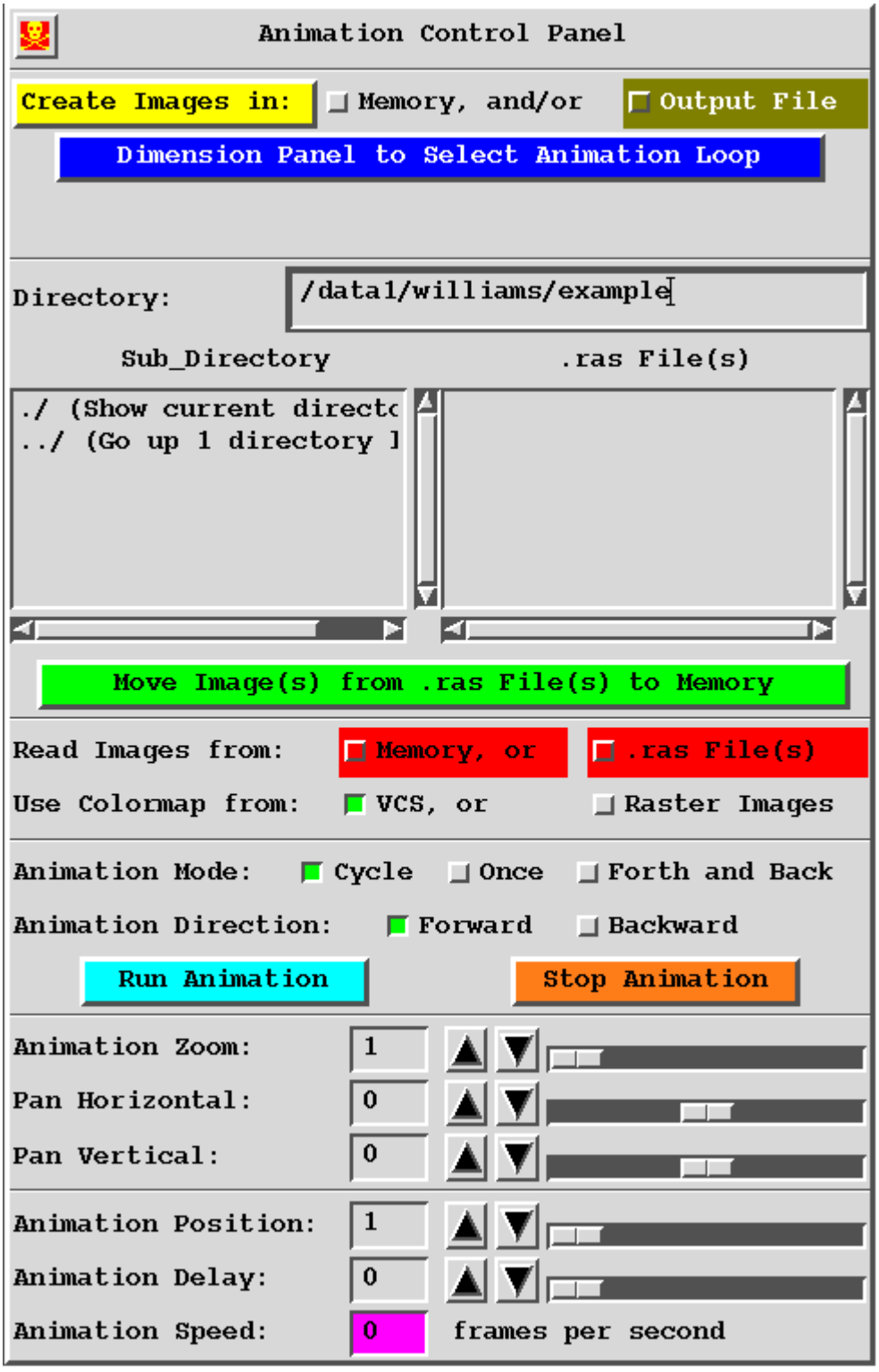
See also the Example on Modifying Data.

Step 3: Creating a Logical Mask Function

In the yellow 'LogicalMask' input text window, enter 'psl1015'. Then select the red 'Apply' button (located in the upper right corner of the Data Editor Panel) to view changes. The 'psl' values less than or equal to 1015 are masked out and the plot is redrawn on the VCS Canvas.

VCS Example: Quick Animation





Description

The Animation Control Panel is used to create sequences of raster images either in memory or in an output file. Once created, these raster images can be animated, subject to user control. This example shows how to:

create raster images in an output file or in memory run animations from a file or from memory change the animation position, delay, and speed step through individual frames of an animation change the animation mode and direction change the animation colormap pan and zoom in on the animation

Step 1: Specifying the Template, Graphics Method, and Data

For this example, use the template attribute set name 'default' (accessed via Main Menu: 'Primary' - 'Template Table'). Enter this 'default' template in the green window of the picture descriptor form on the Page Description Panel.

Use the Boxfill graphics method (accessed via Main Menu: 'Primary' - 'Graphics Table' - 'Boxfill'), and create an 'example' attribute set by editing the Boxfill 'default' attribute set as follows. Change the 'default' maximum and minimum values by setting the Boxfill Editor Panel's 'level_1' and 'level_2' values to '-40' and '40', respectively (thereby fixing the colorbar range--see the Example on Modifying Boxfill Attributes for procedures). Enter this Boxfill 'example' attribute set name in the blue window of the picture descriptor form on the Page Description Panel.

Select the ***example.nc*** data file from the Data Selection Panel, move the pointer over the 'tas' variable in this Panel's 'Variables' scroll window, and double-click the left mouse button. The data set attribute name 'tas (3D)' will appear in the red Data Panel above.

In order to display the data, select 'tas (3D)' from the red Data Panel with the *middle* mouse button. Then move the pointer to the red window of the picture descriptor form on the Page Description Panel and click the *middle* mouse button. This action will plot the 'tas (3D)' data by the 'Boxfill' graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods).

Step 2: Creating an Animation Output File

Access the Animation Control Panel (via Main Menu: 'Animation' - 'Animation Control Panel'). Then move the pointer over the olive green 'Output File' toggle button and click the left mouse button--an 'Output File' text window will appear below. Enter the string 'example' in this text window.

Next, move the pointer over the yellow 'Create Images in' button and click the left mouse button. This action will create 12 raster images in the file ***example.ras***. Wait until all raster images are stored before proceeding to the next step. (The ***example.ras*** file will be displayed in the Animation Control Panel's '.ras File(s)' scroll window when this process is complete.)

Step 3: Running an Animation from a Raster File

To run the animation of file ***example.ras***, select the 'example.ras' string in the '.ras. File(s)' scroll window on the Animation Control Panel. A '1' then will appear in front of the file name (i.e., '1 example.ras'). Next, select the cyan 'Run Animation' button--the animation will begin. To stop the animation, select the orange 'Stop Animation' rectangle.

Step 4: Loading and Running an Animation Raster File in Memory

Running an animation from memory is much more efficient that running from a raster file. To copy images from raster file ***example.ras*** into memory, select the string 'example.ras' in the '.ras File(s)' scroll window . A '1' will appear in front of the text string (i.e., '1 example.ras'). Then select the green 'Move Image(s) from .ras File(s) to Memory' button. The 'Animation Position' input text window (see bottom of the Animation Control Panel) will indicate the number of frames read into memory. Select the cyan 'Run Animation' button to start the animation.

Step 5: Changing the Animation Position, Delay, and Speed

The 'Animation Position', 'Animation Delay', and 'Animation Speed' text windows are located at the bottom of the Animation Control Panel. The 'Animation Position' and 'Animation Speed' windows indicate, respectively, the current image frame and the number of frames per second that are being viewed. The *higher* the number appearing in the 'Animation Delay' text window, the *lower* the animation speed. The animation delay (and therefore the animation speed) can be varied by use of the associated up/down arrows or slider button. *Once the animation is*

stopped (see **Step 3**), the animation position also can be varied in the same way (i.e., it is possible to step through individual frames of the animation).

Step 6: Changing the Animation Mode

Change the animation mode by selecting the 'Animation Mode' toggle button 'Forth and Back' (i.e., animation proceeding to the end of the sequence of images, and then reversing direction) on the lower part of the Animation Control Panel). Change the animation mode back to 'Cycle' (animation proceeding unidirectionally in a closed loop) before proceeding further.

Step 7: Changing the Animation Direction

Change the animation direction by selecting the 'Animation Direction' toggle button 'Backward' on the lower part of the Animation Control Panel). Change the animation direction back to 'Forward' before proceeding further.

Step 8: Changing the Animation Colormap

While the animation is running, access the Colormap Editor/Table Panel (via Main Menu: 'Basic'-'Colormap Editor/Table'). Select the 'example' colormap created in the Example on Creating and Modifying Colormaps. The animation color will change, reflecting the use of the new ('example') colormap. Modify color index '200' to view the associated data values reflected in the animation. (See the Example on Creating and Modifying Colormaps for procedures.)

Next, remove the Colormap Editor/Table Panel by selecting its 'skull and crossbones' icon. Then select the 'Use Colormap from Raster Images' toggle button on the Animation Control Panel. This action will cause the animation to use its own colormap, rather than that of VCS.

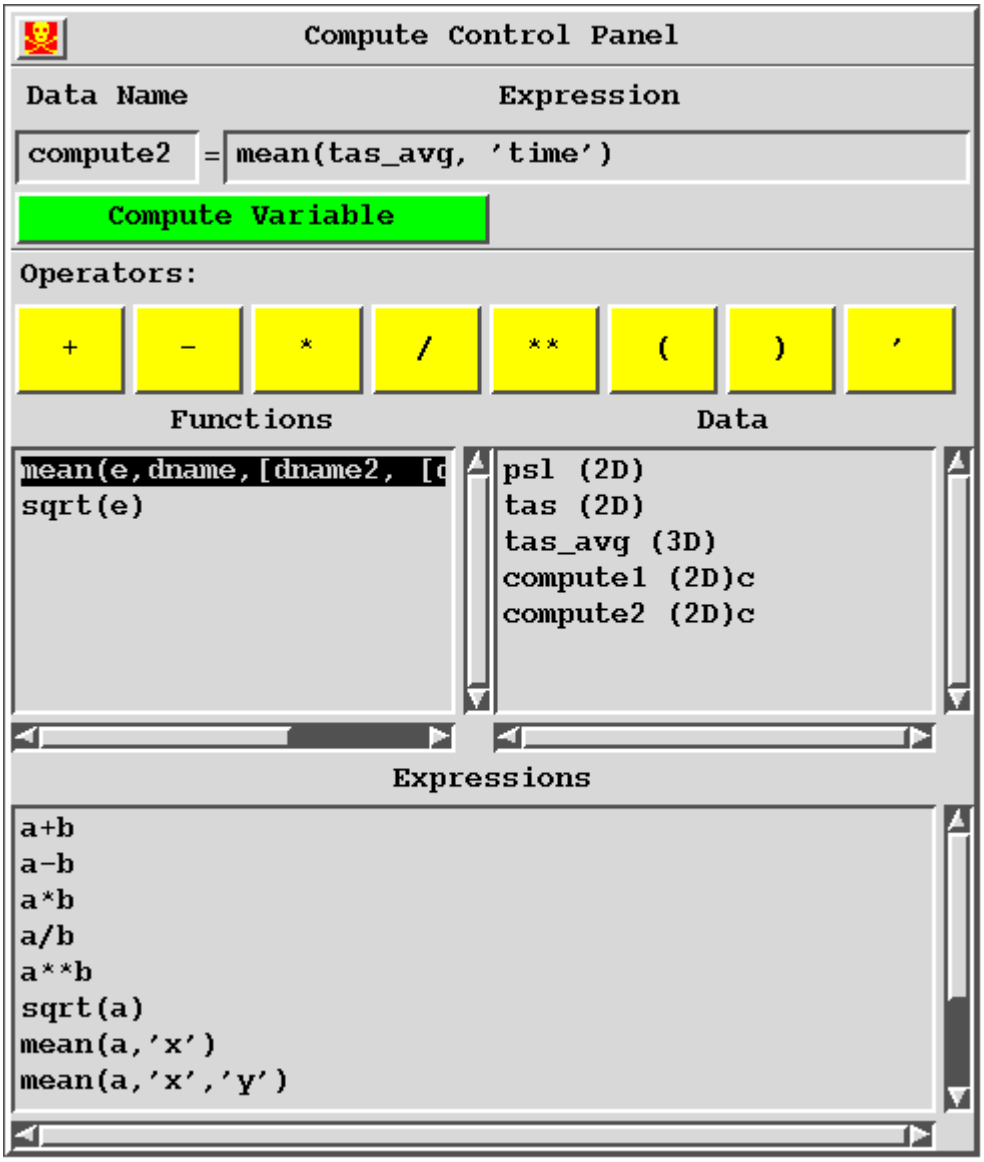
Step 9: Panning and Zooming in on the Animation

While the animation is running, select the 'Pan Horizontal' or 'Pan Vertical' up/down arrows on the lower part of the Animation Control Panel. The animation display will pan back and forth horizontally or up and down vertically. Move the 'Pan Horizontal' and 'Pan Vertical' slider bar to achieve similar results.

While the animation is running, select the 'Animation Zoom' up arrow button--the animation will be magnified. Move the 'Animation Zoom' slider bar to achieve similar results.

See also Hints on the Animation Control Panel.

VCS Example: Computing a New Variable



Description

The Compute Control Panel (see above figure) is used to compute new data attribute sets. This example shows how to create a new data attribute set from the difference of a pair of 2D variables, and how to display the result. This example also shows how to compute and display the temporal mean of a 3D variable.

Step 1: Specifying the Template, Graphics Method, and Data

In this example, use 'default' template and Boxfill graphics method attribute sets in the chosen picture descriptor form on the Page Description Panel. (The template's 'default' attribute set is accessed via Main Menu: 'Primary' - 'Template Table'. The Boxfill 'default' set is accessed via Main Menu: 'Primary' - 'Graphics Table' - 'Boxfill'). See the Example on Creating Plots by Different Graphics Methods

Select the ***example.nc*** data file on the Data Selection Panel; then double click with the left mouse button on strings 'tas' and 'psl' in this Panel's 'Variables' scroll window. The data attribute names 'tas (3D)' and 'psl (3D)' will be displayed in the red Data Panel above.

Once again, select the 'tas' string in the Data Selection Panel's 'Variable' scroll window. Then move the pointer to the 'Select A_' input text window and click the left mouse button. Change the name of the variable from 'tas' to 'tas_avg', and press the 'Select' button to the left. The data attribute name 'tas_avg (3D)' will appear in the red Data Panel above.

Step 2: Reducing the 'tas' and 'psl' Dimension Size

In the red Data Panel, select the string 'psl (3D)'. The Data Editor Panel then will appear below. Scroll the window to the bottom, and change 'zlast' from '12' to '1'. Press the red 'Apply' button to save these changes. The dimension size of variable 'psl (3D)' is reduced to 2D. Follow the same procedure to reduce the dimension size of the 'tas(3D)' variable.

Step 3: Creating and Plotting Computed Difference Data

Access the Compute Control Panel (via Main Menu: 'Compute' - 'Compute Control Panel'). Then move the pointer to the 'Data Name' input text window and click the left mouse button. Enter the desired data attribute name (e.g., 'compute1'). Next, select the string 'psl (2D)' in the red Data Panel. The string 'psl' will appear in the 'Expression' input text window. Then select the yellow '-' operator button. A '-' will appear to the right of the 'psl' string in the 'Expression' input text window. Next, select the string 'tas (2D)' in the red Data Panel. The string 'psl - tas' will appear in the 'Expression' input text window (which can be edited further if desired). Finally, select the 'Compute Variable' button. The string 'compute1 (2D)c' will appear in the red Data Panel above. (The 'c' appended to the string compute1 (2D) indicates completion of the computation.)

In order to display the computed data, select with the *middle* mouse button the string 'compute1 (2D)c' in the red Data Panel. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'compute1 (2D)c' data by the 'Boxfill' graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods).

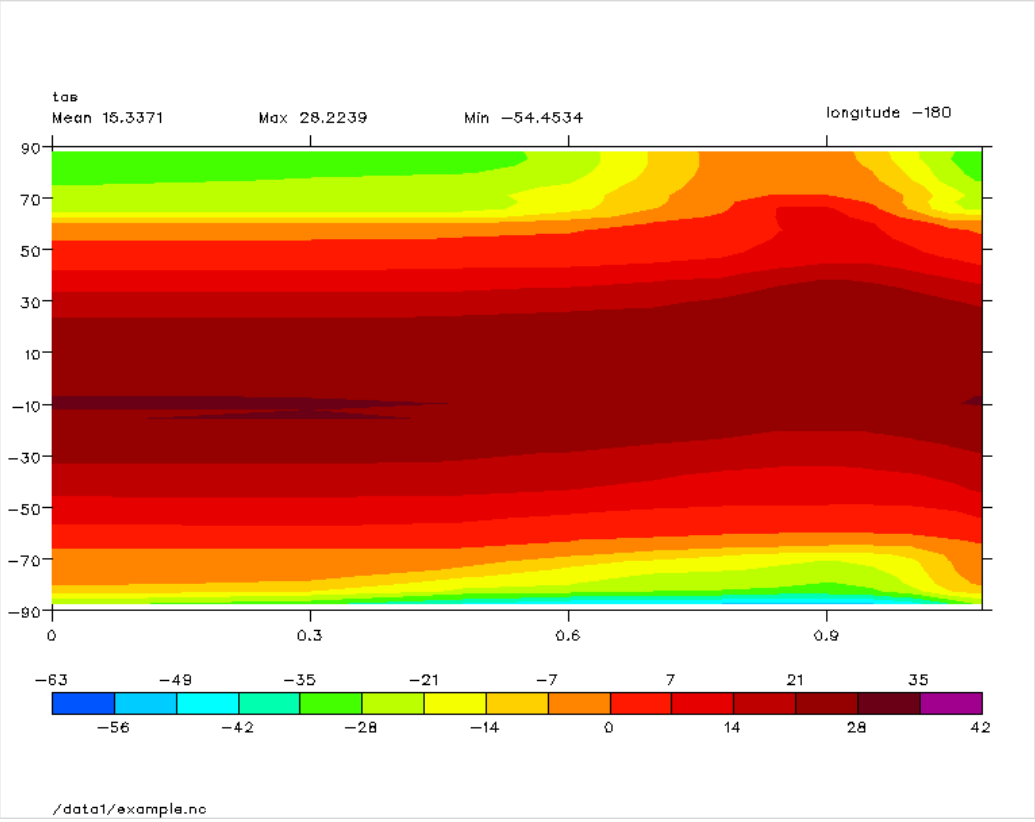
Step 4: Creating and Plotting Computed Temporal Mean Data

Move the pointer to the 'Data Name' input text window on the Compute Control Panel and click the left mouse button. Enter the desired data attribute name (e.g., 'compute2'). Then clear the 'Expression' input text window by double-clicking on the string 'psl - tas' with the left mouse button and press 'Backspace' on the keyboard. Next, select the 'mean(e, dname, [dname2, ...' string in the Compute Control Panel's 'Functions' scroll window. The string 'mean(' will appear in the 'Expression' input text window. Then select the string 'tas_avg (3D)' in the red Data Panel. The string 'tas_avg' will appear in the 'Expression' input text window. Next, move the pointer over the 'Expression' input text window and click the left mouse button. Enter the string 'time)' to indicate that it is the dimension with name 'time' over which the mean is to be computed. Finally, select the green 'Compute Variable' button. The string 'compute2 (2D)c' will appear in the red Data Panel above.

In order to display the computed data, select with the *middle* mouse button the string 'compute2 (2D)c' in the red Data Panel. Move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'compute2 (2D)c' time-mean data by the Boxfill graphics method on the VCS Canvas. (See the Example on Creating Plots by Different Graphics Methods).

See also Hints on the Compute Control Panel for further details.

VCS Example: Changing X- and/or Y-Axis Representation



Description

This example shows how to change the x- and/or y-axis of a graphics method. (In this example, the Isofill Graphics Method will be used for illustration.) For each graphics method, the x- and/or y-axis can be changed from linear to: log base 10 ('log10'), natural log ('ln'), exponential ('exp'), or area weighted ('area_wt'). *Note, the 'projection' mode in the graphics method must be set to 'Linear' in order to implement the axis change(s).*

Step 1: Displaying Data with the Isofill Graphics Method

Access the blue Isofill Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Isofill'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, move the pointer over the Isofill 'default' attribute set name and click the *middle* mouse button. Next move the pointer over the Isofill menu button, and press and hold the left mouse button. Then move over the 'Copy' item and release the left mouse button--a popup window will appear. Enter a new Isofill attribute set name (e.g., 'example'), and select the 'Save' button. The 'example' attribute set name will appear in the blue Isofill Graphics Method Panel. This is the new 'Isofill' attribute set that will be utilized in this example.

Use this newly created 'Isofill' attribute set name and the Template Panel's 'default' attribute set name in the chosen picture descriptor form located in Page Description Panel. Move the pointer over the ***example.nc*** file in the Data Selection Panel, and click the left mouse button. Then move the pointer over the 'tas' variable in this Panel's 'Variables' scroll window and double-click the left mouse button. The data set attribute name 'tas (3D)' will appear in the red Data Panel above.

In order to display the data, move the pointer over 'tas (3D)' in the red Data Panel, and click the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'tas (3D)' data with the Isofill graphics method on the VCS Canvas.

See also the Example on Modifying Isofill Attributes.

Step 2: Accessing the Data Editor Panel

Move the pointer over the displayed data attribute set name (i.e., 'tas (3D)') in the red Data Panel and click the left mouse button. The Data Editor Panel '(A_tas)' will appear below.

See also the Example on Modifying Data.

Step 3: Accessing the Dimension Manipulation Panel

Select the blue 'Dim' button at the top of the Data Editor Panel to access the Dimension Manipulation Panel. The 'X-longitude' and 'Y-latitude' coordinate dimension values will be displayed.

See also the Example on Modifying Data.

Step 4: Transposing the X and Z Dimensions

Transpose the 'X' and 'Z' dimensions by moving the pointer over the 'longitude' dimension button, located at the top of the first column's control area on the Dimension Manipulation Panel, and click the left mouse button. A scroll window displaying all the dimension names will appear. Move the pointer over the desired 'Z - time' dimension name and click the left mouse button--the 'X' and 'Z' dimension will be transposed. Then select the red 'Apply' button (located in the upper right corner of the Dimension Manipulation Panel) to view the changes.

See also the Example on Modifying Data.

Step 5: Accessing the Isofill Editor Panel

Scroll down the window of the blue Isofill Graphics Method Panel until the 'example' string is visible, then select 'example' with the left mouse button. The Isofill Editor Panel will appear below--scroll this Panel to the bottom.

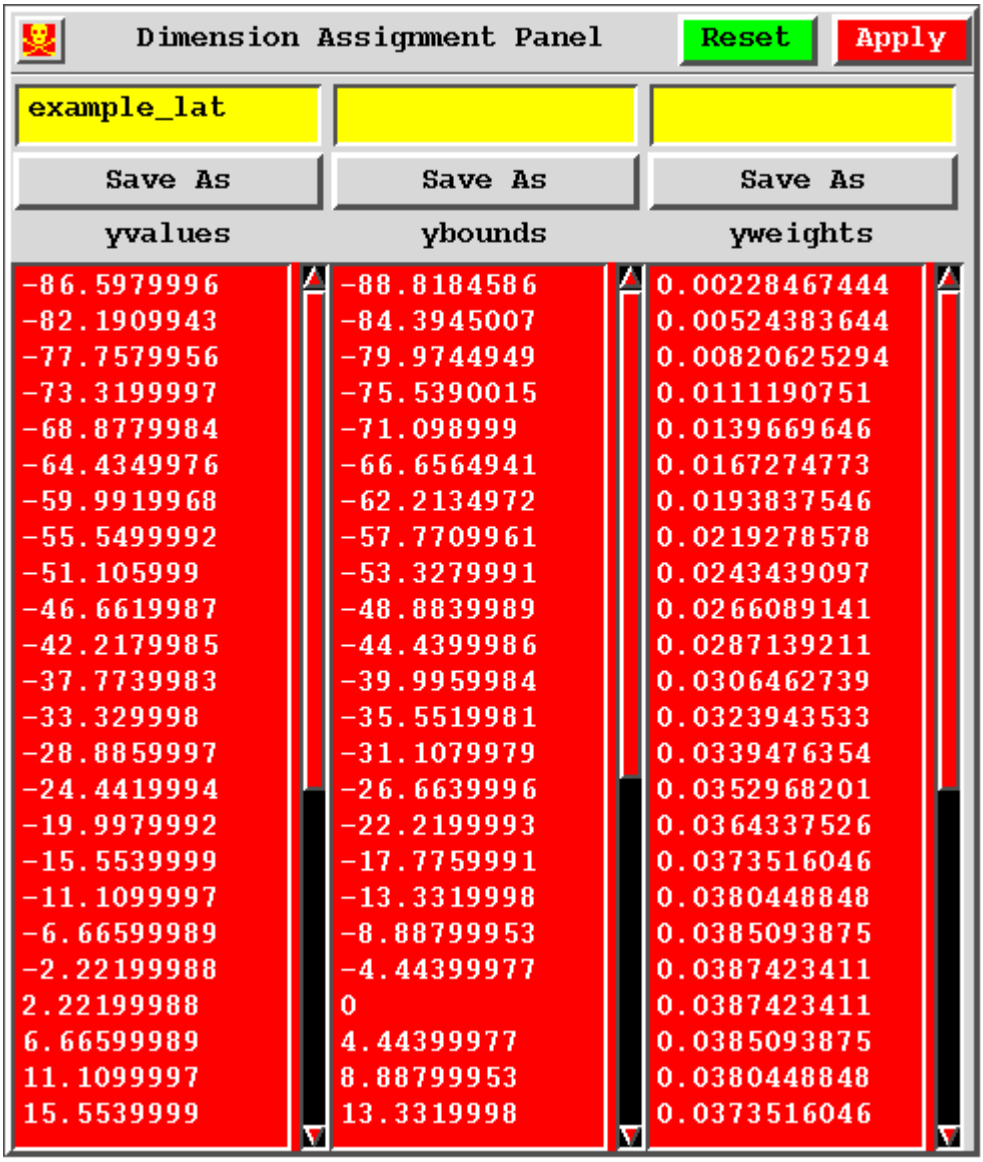
See also the Example on Modifying Isofill Attributes.

Step 6: Changing the X-Axis Representation

Move the pointer over the 'xaxisconvert' pulldown menu button on the Isofill Editor Panel, and press and hold the left mouse button. Next, move the pointer over the 'log10' menu item and release the left mouse button. Select the red 'Apply' button (located in the upper right corner of the Isofill Editor Panel) to view the changes.

Repeat the above process, but this time select item 'area_wt' (area weighted) from the 'xaxisconvert' menu.

VCS Example: Grid Transformations



Description

The Dimension Assignment Panel (see above figure) displays dimension coordinate values, bounds, and weights. It can be used to create lists that are displayed by the List Table Panel (see figure below) and to transform the data attribute set to a different grid. This example shows how to create two new lists and how to display the list attribute sets in the List Table Panel. This example also shows how to view the list values and strings by use of the List Editor Panel (see figure below), and how to transform a surface temperature field to a different grid and display the results.

Step 1: Specifying the Template, Graphics Method, and Data

In this example, use 'default' template and Boxfill graphics method attribute sets in the chosen picture descriptor form on the Page Description Panel. (The template's 'default' attribute set is accessed via Main Menu: 'Primary' -

'Template Table'. The Boxfill 'default' set is accessed via Main Menu: 'Primary' - 'Graphics Table' - 'Boxfill'.)

Select the ***example.nc*** file in the Data Selection Panel. Then move the pointer over both the 'tas' and the 'tas_sunya' strings in this Panel's 'Variables' scroll window and double-click the left mouse button. The data attribute names 'tas (3D)' and 'tas_sunya (3D)' will appear in the red Data Panel above.

In order to display the data, select 'tas (3D)' with the *middle* mouse button from the red Data Panel. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'tas (3D)' data by the Boxfill graphics method on the VCS Canvas.

See also the Example on Creating Plots by Different Graphics Methods.

Step 2: Creating the Longitude List Attribute

In the red Data Panel, move the pointer over 'tas_sunya (3D)' and click the left mouse button--the Data Editor Panel will appear below. Scroll down until the cyan 'VALUES - X' button is visible, move the pointer over this button, and click the left mouse button. The Dimension Assignment Panel will appear showing the values ('xvalues'), the bounds ('xbounds'), and the weights ('xweights') of each longitudinal point.

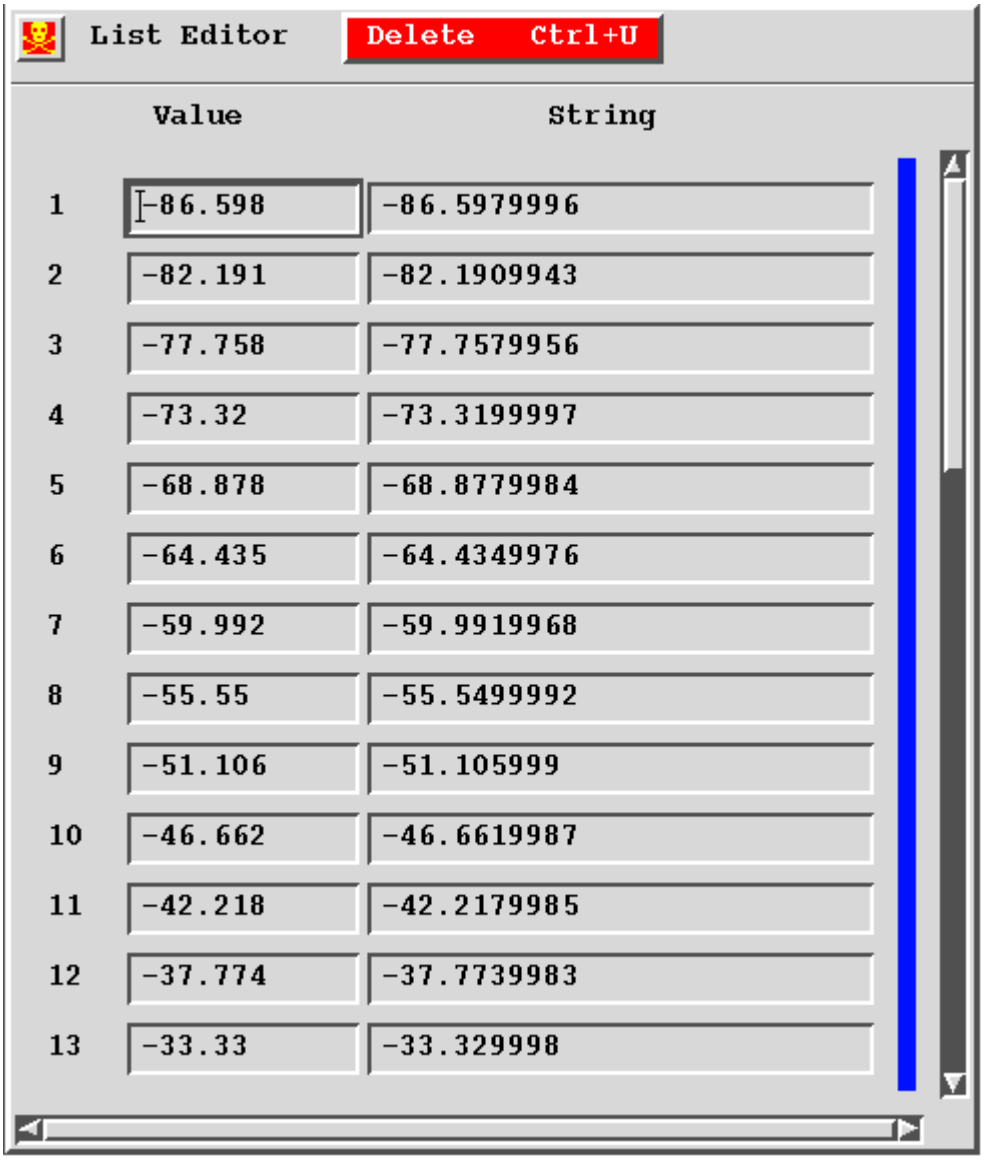
Next, select the 'Save As' button that is located above the 'xvalues' label on the Dimension Assignment Panel--a popup window will appear. Then enter the new list attribute name (e.g., 'example_lon') and select the 'Save' button to create the list attribute. Select the 'skull and crossbones' icon to remove the Dimension Assignment Panel--the Data Editor Panel will reappear.

Step 3: Creating the Latitude List Attribute

Scroll the Data Editor Panel down until the cyan 'VALUES - Y' button is visible, then select it with the left mouse button. The Dimension Assignment Panel will appear showing the 'yvalues', 'ybounds', and 'yweights' of each latitude point. Then select the 'Save As' button (located above the 'yvalues' label)--a popup window will appear. Enter the new list attribute name (e.g., 'example_lat') and select the 'Save' button to create the list attribute set. Then select the 'skull and crossbones' icon to remove the Dimension Assignment Panel--the Data Editor Panel will reappear.

Step 4: Viewing the New List Attribute Set Names, Values, and Strings

Access the yellow List Table Panel (via Main Menu: 'Basic' - 'List Table'). (It will cover the green Template Panel.) Scroll down until the newly created list attribute names (e.g., 'example_lon', and 'example_lat') are visible. Then move the pointer over the 'example_lat' string and click the left mouse button. The List Editor Panel will appear below--scroll down and inspect the 'Value' and 'String' columns. Then select the 'skull and crossbones' icon to remove the List Editor Panel. The Data Editor Panel will reappear.



Step 5: Transforming Data to a Different Grid

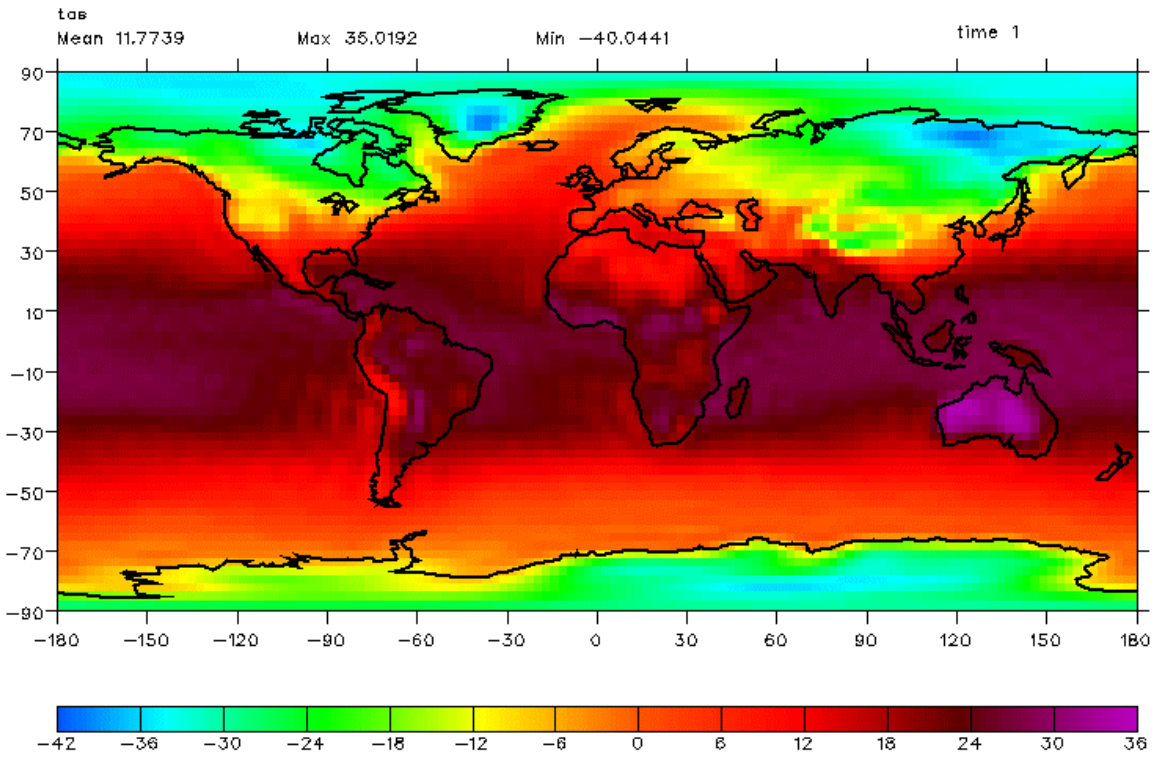
Move the pointer over the 'tas (3D)' in the red Data Panel and click the left mouse button. The Data Editor Panel will appear below. Scroll down until the cyan 'VALUES - X' button is visible, then select it with the left mouse button. The Dimension Assignment Panel will appear showing the values 'xvalues', bounds 'xbounds', and weights 'xweights' of each longitude point.

Access the List Table Panel (via Main Menu: 'Basic' - 'List Table'). (It will cover the Template Panel.) Scroll down until the recently created list attribute names (e.g., 'example_lon', and 'example_lat') are visible. Move the pointer over the 'example_lon' string and click the *middle* mouse button. Then move the pointer over the first yellow input text window in the Dimension Assignment Panel (above the 'xvalues' label), and click the *middle* mouse button--the 'example_lon' string will appear in the input text window. Select the red 'Apply' button to view the results on the VCS Canvas. Then select the 'skull and crossbones' icon to remove the Dimension Assignment Panel--the Data Editor Panel will reappear. Scroll down until the cyan 'VALUES - Y' button is visible, then select it with the left mouse button. The Dimension Assignment Panel will appear showing the 'yvalues', 'ybounds', and 'yweights' of each latitude point.

Next, access the Lists Table Panel (via Main Menu: 'Basic' - 'List Table'). (It will cover the green Template Panel.) Then scroll down until the recently created list attribute names (e.g., 'example_lon', and 'example_lat') are visible. Move the pointer over the 'example_lat' string and click the *middle* mouse button. Then move the pointer over the first yellow input text window in the Dimension Assignment Panel (above the 'yvalues' label) and click the *middle* mouse button--the 'example_lat' string will appear in the input text window. Select the red 'Apply' button to view the results on the VCS Canvas. Then select the 'skull and crossbones' icon to remove the Dimension Assignment Panel--the Data Editor Panel will reappear.

See also Hints on the Dimension Assignment Panel, the Data Editor Panel, the List Table Panel, and the List Editor Panel for further details.

VCS Example: Exercising VCS Canvas Features-- Changing Display Orientation/Size and Using Zoomin Option



s /data1/williams/example/example.nc

Description

The VCS Canvas is used to display plots, run animations, and modify templates. This example shows how to exercise other options, including how to change the VCS Canvas orientation, to display the VCS Canvas in full-screen mode, to zoom in on a VCS image, and to zoom in on data.

Step 1: Specifying the Template, Graphics Method, and Data

In this example, use 'default' template and Boxfill graphics method attribute sets in the chosen picture descriptor form on the Page Description Panel. (The template's 'default' attribute set is accessed via Main Menu: 'Primary' - 'Template Table'. The Boxfill 'default' set is accessed via Main Menu: 'Primary' - 'Graphics Table' - 'Boxfill'.)

Select the ***example.nc*** file in the Data Selection Panel. Then move the pointer over the 'tas' string in this Panel's 'Variables' scroll window and double-click the left mouse button. The data attribute name 'tas (3D)' will appear in the red Data Panel above.

In order to display the data, select 'tas (3D)' with the *middle* mouse button from the red Data Panel. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'tas (3D)' data by the Boxfill graphics method on the VCS Canvas (see above figure).

See also the Example on Creating Plots by Different Graphics Methods.

Step 2: Changing the Canvas Orientation

Change the VCS Canvas orientation from "landscape" (width exceeding height, as in the above figure) to "portrait" (height exceeding width) via Main Menu: 'Canvas' - 'Portrait'. Revert to landscape orientation via Main Menu: 'Canvas' - 'Landscape'.

Step 3: Displaying the Canvas in Full-Screen Mode

Display the Canvas at the size of the entire VCS window via Main Menu: 'Canvas' - 'Full Screen'. Revert to the smaller-sized Canvas by selecting the red 'Restore Size' button.

Step 4: Zooming in on an Image

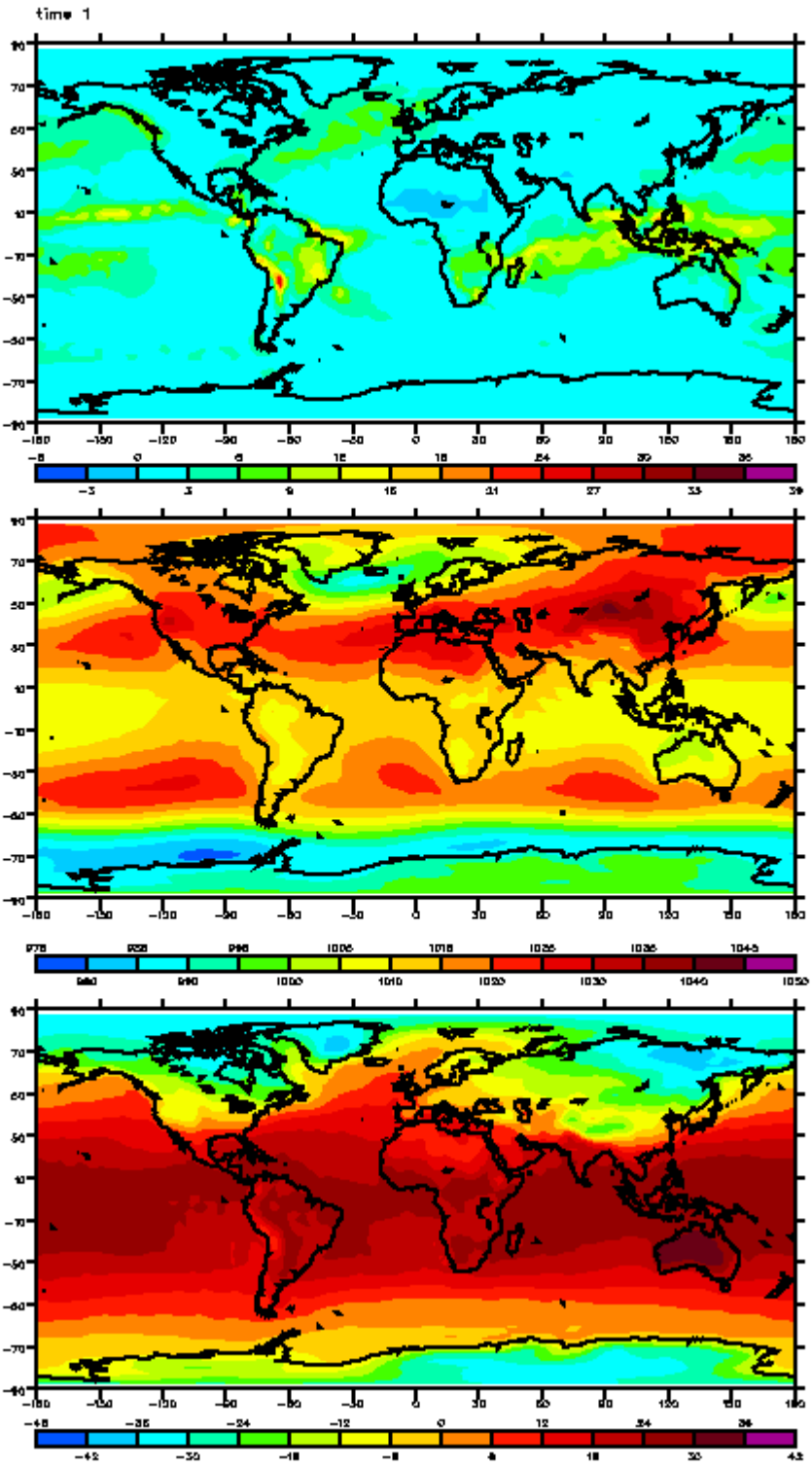
Zoom in on the pixmap of an image on the VCS Canvas via Main Menu: 'Canvas' - 'Zoom Screen'. Then move the pointer over the Canvas image on the boundary of the desired region for zooming and click the left mouse button. A semi-complete 'X' will appear on the Canvas. Next, press and hold the *middle* mouse button while moving the pointer--a box outlining the region will be displayed. Release the middle mouse button when the desired region for zooming is enclosed. VCS will zoom in on the selected region. To restore the original image, move the pointer to any spot on the VCS Canvas and click the *right* mouse button.

Step 5: Zooming in on Data

Exercise the option to zoom in on data via Main Menu: 'Canvas' - 'Zoom Data'. Then move the pointer over the VCS Canvas image on the boundary of the desired region for zooming and click the left mouse button. A semi-complete 'X' will appear on the Canvas. Next, press and hold the *middle* mouse button while moving the pointer--a box outlining the region will be displayed. Release the middle mouse button when the desired region for zooming is enclosed. VCS will retrieve the data subset and replot these data. To restore the original plot, move the pointer to any spot on the VCS Canvas and click the *right* mouse button.

See also Hints on the VCS Canvas.

VCS Example: Exercising VCS Canvas Options-- Generating Multiple Plots, Using Portrait Mode, and Deferring Displays



Description

This example shows how to create multiple plots on the VCS Canvas. In the course of doing so, the display and printing of plots in the "portrait" orientation (i.e., height exceeding width) is demonstrated. Finally, it is shown how to defer the updating of graphical displays until a later time, a useful option when generating templates or displaying numerous plots.

Step 1: Creating Picture Descriptor Forms

To create a new picture descriptor form, move the pointer over the 'Options' menu button in the Page Description Panel, and hold down the left mouse button. Then move the pointer over the 'Picture' menu item while continuing to hold down the left mouse button. Next, move the pointer over the 'Create' pull-right menu item and release the left mouse button. A new picture descriptor form will appear in the Page Description Panel's form list.

Repeat the above procedure to create another picture descriptor form. (Three picture descriptor forms are required in this example.)

Step 2: Changing the VCS Canvas Orientation

Change the VCS Canvas orientation from "landscape" (width exceeding height) to "portrait" (height exceeding width) via Main Menu: 'Canvas' - 'Portrait'.

Step 3: Displaying Data with the Isofill Graphics Method

Access the blue Isofill Graphics Method Panel (via Main Menu: 'Primary' - 'Graphics Table' - 'Isofill'). *Note, VCS does not allow the modification of any 'default' attribute sets.* Therefore, move the pointer over the Isofill 'default' attribute set name and click the *middle* mouse button. Next, move the pointer over the Isofill menu button, and press and hold the left mouse button. Then move over the 'Copy' item and release the left mouse button--a popup window will appear. Enter a new Isofill attribute set name (e.g., 'example'), and select the 'Save' button. The 'example' attribute set name will appear in the blue Isofill Graphics Method Panel. This is the new Isofill attribute set that will be utilized in this example.

Use this newly created Isofill 'example' attribute set name and the Template Panel's 'por_topof3' attribute set name in the *first* picture descriptor form located on the Page Description Panel. Also use this Isofill 'example' set together with the Template Panel's 'por_midof3' attribute set name in the *second* picture descriptor form. Finally, use this Isofill 'example' set together with the Template Panel's 'por_botof3' attribute set name in the *third* picture descriptor form.

Move the pointer over the ***example.nc*** file in the Data Selection Panel, and click the left mouse button. Then move the pointer over the 'pr' variable in this Panel's 'Variables' scroll window and double-click the left mouse button. The data set attribute name 'pr (3D)' will appear in the red Data Panel above.

Repeat the above procedure for the 'psl' and 'tas' variables. The red Data Panel then should contain three data set attribute names: 'pr (3D)', 'psl (3D)', and 'tas (3D)'.

In order to display the data, move the pointer over 'pr (3D)' entry in the red Data Panel, and click the *middle* mouse button. Then move the pointer to the red input text window in the first picture descriptor form and click the *middle* mouse button. This action will plot the 'pr (3D)' data with the Isofill graphics method on the VCS Canvas.

Repeat the above step for the 'psl (3D)', and 'tas (3D)' data set attribute names, placing them in the second and third picture descriptor forms, repectively. Their plots then will also appear on the VCS Canvas.

See also the Example on Creating Plots by Different Graphics Methods).

Step 4: Saving the Output File and Printing in Postscript

Access the CGM Panel (via Main Menu: 'File'- 'Save CGM') and create a CGM file (e.g., ***example.cgm***). Then access the Print CGM Panel (via Main Menu: 'File'- 'Print CGM') and change the 'Printer Orientation' to 'Portrait' before sending the plot to the printer.

See also the Example on Printing CGM files.

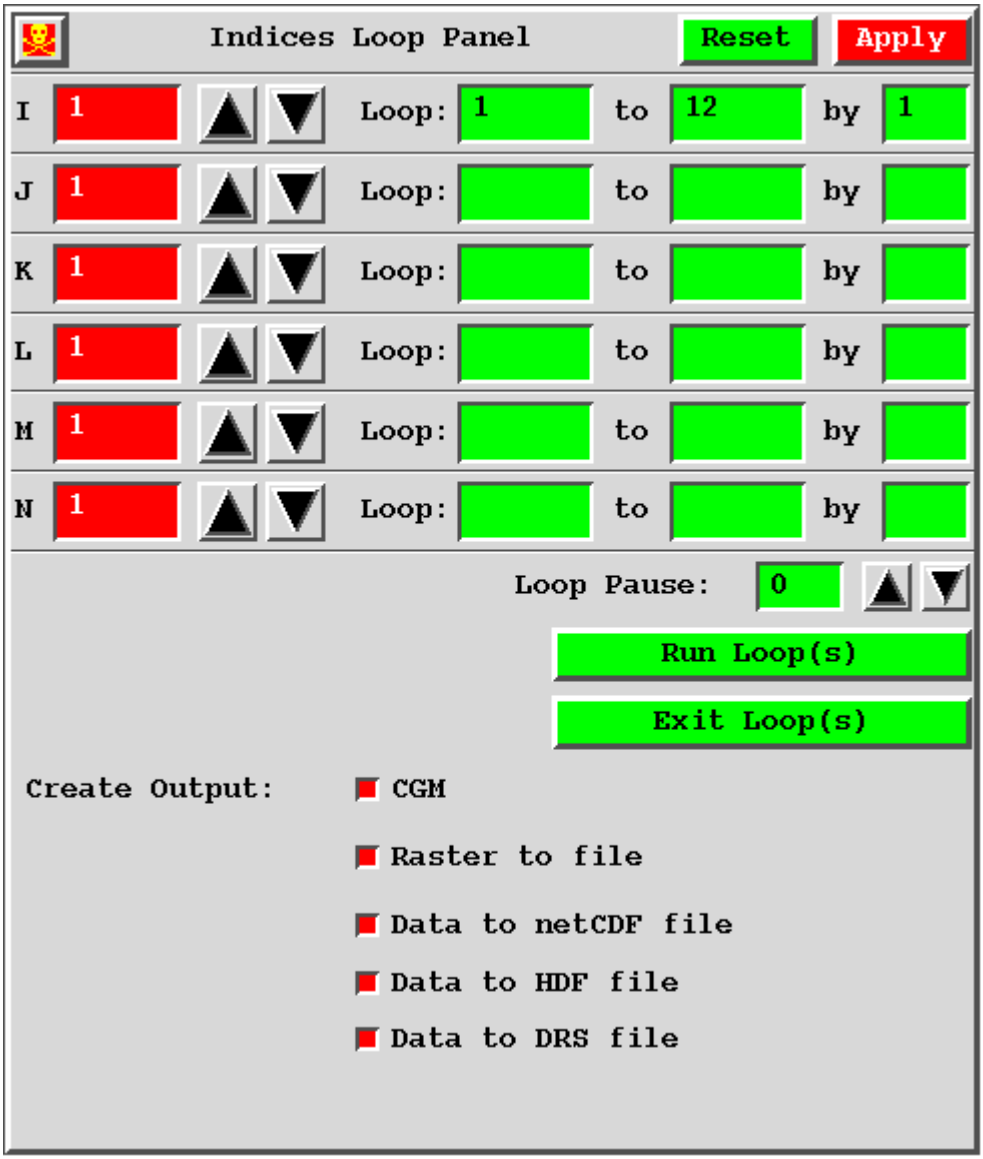
Step 5: Deferring the Updating of the Graphical Displays

Move the pointer over the 'Options' menu button, in the Page Description Panel, and hold down the left mouse button. Then move the pointer over the 'Update' menu item while continuing to hold down the left mouse button. Next, move the pointer over the 'Manual' pull-right menu item and release the left mouse button.

Then switch 'Off' the first picture descriptor form in the Page Description Panel by selecting its green 'On' button--nothing will change on the VCS Canvas. Next, move the pointer over the 'Options' menu button, in the Page Description Panel, and hold down the left mouse button. Then move the pointer over the 'Update' menu item while continuing to hold down the left mouse button. Next, move the pointer over the 'Now' pull-right menu item and release the left mouse button--the VCS Canvas is now updated.

Repeat this procedure, experimenting with the use of the 'Automatic' vs 'Manual' updating modes.

VCS Example: Using the Indices Loop Panel



Description

The Indices Loop Panel (see above figure) is used to loop over global indices (I, J, K, L, M, and N) of data attribute sets. This example shows how to set up a 3D data attribute set so the Indices Loop Panel can loop over the third dimension (e.g., 'time'). This example also shows how to save multiple cgm output, raster output, and DRS output in a single file.

Step 1: Specifying the Template, Graphics Method, and Data

In this example, use 'default' template and Boxfill graphics method attribute sets in the chosen picture descriptor form on the Page Description Panel. (The template's 'default' attribute set is accessed via Main Menu: 'Primary' - 'Template Table'. The Boxfill 'default' set is accessed via Main Menu: 'Primary' - 'Graphics Table' - 'Boxfill'.)

Select the ***example.nc*** file in the Data Selection Panel. Then move the pointer over the 'tas' string in this Panel's 'Variables' scroll window and double-click the left mouse button. The data attribute name 'tas (3D)' will appear in the red Data Panel above.

In order to display the data, select 'tas (3D)' with the *middle* mouse button from the red Data Panel. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. This action will plot the 'tas (3D)' data by the Boxfill graphics method on the VCS Canvas.

See also the Example on Creating Plots by Different Graphics Methods.

Step 2: Indexing the Third Dimension

Access the Data Editor Panel by moving the pointer over the 'tas (3D)' string in the red Data Panel and clicking the left mouse button. Scroll down until 'zfirst' and 'zlast' are visible.

Next, access the yellow List Table Panel (via Main Menu: 'Basic' - 'List Table'), and scroll down until the string 'months10yr' is visible. Move the pointer over 'months10yr' and click the *middle* mouse button. Then move the pointer over the yellow 'zfirst' input text window in the Data Editor Panel, and click the *middle* mouse button.

Next, move the pointer over the yellow 'zlast' input text window on the Data Editor Panel, and click the *middle* mouse button. The string 'months10yr' will be displayed in both yellow input text windows. Finally, edit the yellow 'zfirst' and 'zlast' input text windows on the Data Editor Panel to include an index (e.g., I). The yellow input text windows then will show the string 'months10yr[I]'. Select athe red 'Apply' button to save these changes.

Step 3: Changing the Index Value

Access the Indices Loop Panel (via Main Menu: 'File' - 'Multi-Saves (Indices)') Move the pointer over the 'I' up arrow and click the left mouse button--a '2' will appear in the red 'I' input text window. Then select the red 'Apply' button to view the results--the string 'time 2' will be displayed on the VCS Canvas. *Note, the 'time' dimension of 'tas (3D)' has only 12 values (i.e., months 1 through 12); if a value that is not in this range is entered, VCS will remove the 'month10yr[I]' string in 'zfirst' and 'zlast' and replace it with a '1'. If this occurs, then repeat* ***Step 2***.

Step 4: Setting Up and Stepping Through Index Values

Edit the first row only (i.e., the 'I' row corresponding to 'months10yr[I]') on the Indices Loop Panel as follows. Move the pointer to the green 'Loop:' input text window and click the left mouse button--enter a '1'. Then move the pointer to the green 'to' input text window and click the left mouse button--enter a '12'. Finally, move the pointer to the green 'by' input text window and click the left mouse button--enter a '1'. The looping on index 'I' now is specified by the starting point ('Loop: 1'), the ending point ('to 12'), and the increment value ('by 1').

Next, select the green 'Run Loop(s)' button on the Indices Loop Panel. The data will be plotted at each time step, as in an animation. To stop looping over the data, select the green 'Exit Loop(s)' button. To slow the plotting of data at each time step, enter the number of seconds pause between plots that is desired in the green 'Loop Pause' input text window.

Step 5: Saving Plots in a Single CGM Output File

To save each plot in a single cgm file, select the 'CGM' toggle button on the Indices Loop Panel. (The CGM Panel will cover the Indices Loop Panel.) Next, enter the 'Output File' name (e.g., 'example') in the CGM Panel's input

text window , and select the green 'Append' or 'Replace' button-- the CGM Panel will disappear. Then select the green 'Run Loop(s)' button on the Indices Loop Panel. Every plot that is displayed will be saved in the cgm output file 'example'.

Step 6: Saving Images in a Single Raster File

To save each image in a single raster file, select the 'Raster to file' toggle button on the Indices Loop Panel. (The Raster Panel will cover the Indices Loop Panel.) Next, enter the 'Output File' name (e.g., 'example') in the Raster Panel's input text window, and select the green 'Append' or 'Replace' button--the Raster Panel will disappear. Then select the green 'Run Loop(s)' button on the Indices Loop Panel. Every plot that is displayed will be saved in the raster output file 'example'. Use the Animation Control Panel to view these raster images.

Step 7: Saving Data in a Single NetCDF File

To save each plot in a single netCDF file, select the 'Data to netCDF file' toggle button on the Indices Loop Panel. The netCDF Panel will appear, covering the Indices Loop Panel. Next, enter the 'Output File' name (e.g., 'example') in the netCDF Panel's input text window. Also, enter the data attribute set name (i.e., 'tas') in the red Data Panel's input text window, and select the green 'Append' or 'Replace' button on the netCDF Panel--the 'netCDF Panel' will disappear. Then select the 'Run Loop(s)' button on the Indices Loop Panel. Every plot that is displayed will be saved in the netCDF output file 'example.nc'.

Step 8: Saving Data in a Single HDF File

To save each plot in a single HDF file, select the 'Data to HDF file' toggle button on the Indices Loop Panel. The HDF Panel will appear, covering the Indices Loop Panel. Next, enter the 'Output File' name (e.g., 'example') in the HDF Panel's input text window. Also, enter the data attribute set name (i.e., 'tas') in the red Data Panel's input text window, and select the green 'Append' or 'Replace' button on the HDF Panel--the 'HDF Panel' will disappear. Then select the 'Run Loop(s)' button on the Indices Loop Panel. Every plot that is displayed will be saved in the HDF output file 'example.hdf'.

Step 9: Saving Data in a Single DRS File

To save each plot in a single DRS file, select the 'Data to DRS file' toggle button on the Indices Loop Panel. The DRS Panel will appear, covering the Indices Loop Panel. Next, enter the 'Output File' name (e.g., 'example') in the DRS Panel's input text window. Also, enter the data attribute set name (i.e., 'tas') in the red Data Panel's input text window, and select the green 'Append' or 'Replace' button on the DRS Panel--the 'DRS Panel' will disappear. Then select the 'Run Loop(s)' button on the Indices Loop Panel. Every plot that is displayed will be saved in the DRS output files 'example.dic' and 'example.dat'.

See also Hints on the Indices Loop Panel.

VCS Example: Creating and Modifying Secondary Attributes

Description

This example shows how to create and modify secondary element attribute sets (e.g., line, text, and marker) .

Step 1: Specifying the Template

In this example, use the 'default' template attribute set (accessed via Main Menu:'Primary'-'Template Table') in the chosen green input text window of the picture descriptor form. (See the Example on Creating Plots by Different Graphics Methods for further guidance.)

Step 2: Specifying the Graphics Method

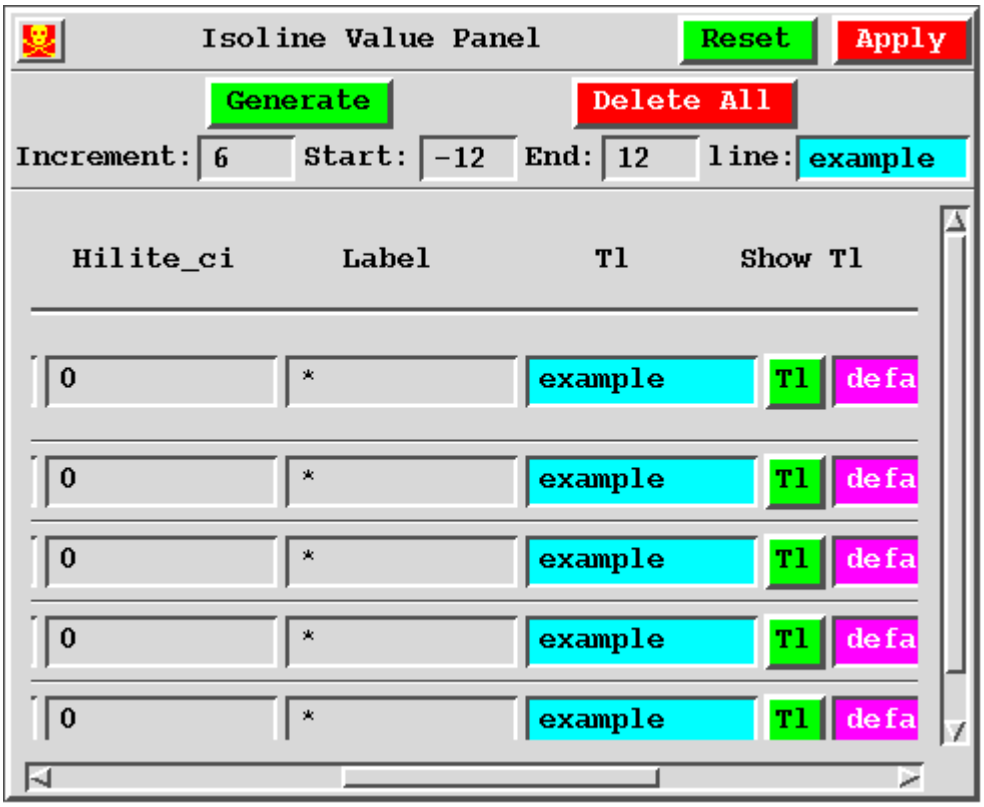
Create a new isoline graphics method attribute set (e.g., 'example') from the 'default' isoline attribute set as follows. Access the Isoline Graphics Method Panel (via Main Menu:'Primary'- 'Graphics Table'- 'Isoline'), and copy the 'default' attribute set to 'example'. Next, specify that the 'example' isoline attribute set will show labels by depressing the 'make_labels' toggle button on the Isoline Editor Panel. (Select the red 'Apply' button to register this

change.) Then copy and drop this 'example' isoline attribute set name into the chosen blue input text window on the picture descriptor form. (See the Example on Modifying Isoline Attributes and the Example on Creating Plots by Different Graphics Methods for further guidance.)

Step 3: Specifying the Data

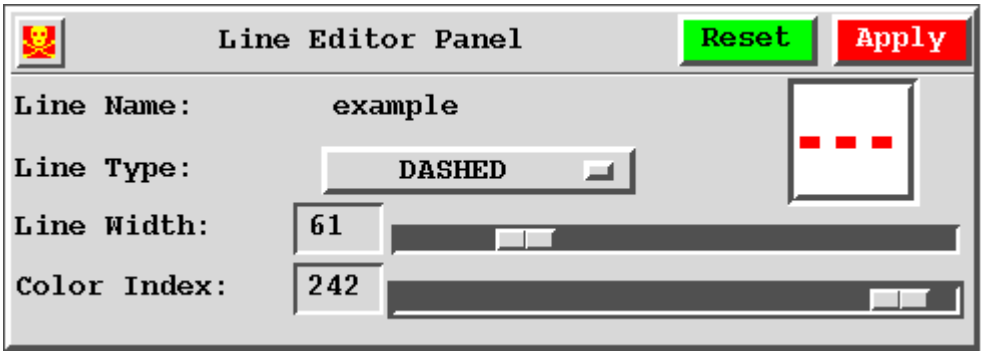
Select the ***example.nc*** file in the Data Selection Panel. Then move the pointer over the 'psl' string in this Panel's 'Variables' scroll window, and double-click the left mouse button. To display the data, select the 'psl (3D)' string in the red Data Panel with the *middle* mouse button. Then move the pointer to the chosen red input text window in the picture descriptor form and click the *middle* mouse button. The isoline plot with isoline labels 'psl' will be displayed on the VCS Canvas.

Step 4: Using the Line Editor Panel



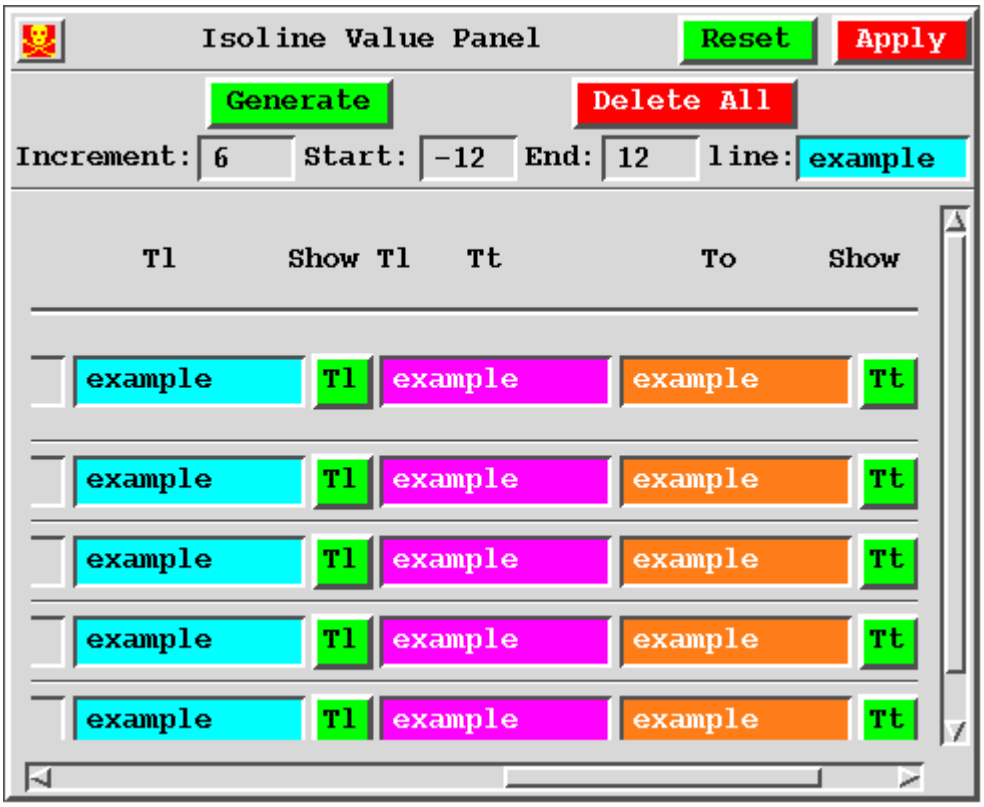
Access the cyan (Tl) Line Table Panel and create a new line attribute set (e.g., 'example') from the 'default'. Next, access the Isoline Value Panel (see the Example on Modifying Isoline Attributes) and enter 6 in the 'Increment' input text window, -12 in the 'Start' input text window, 12 in the 'End' input text window, and 'example' in the cyan 'line' input text window. Then select the green 'Generate' button to generate the new isolines, and select the red 'Apply' button to register the changes.

Next, select this 'example' line attribute set with the left mouse button--the Line Editor Panel will appear below.



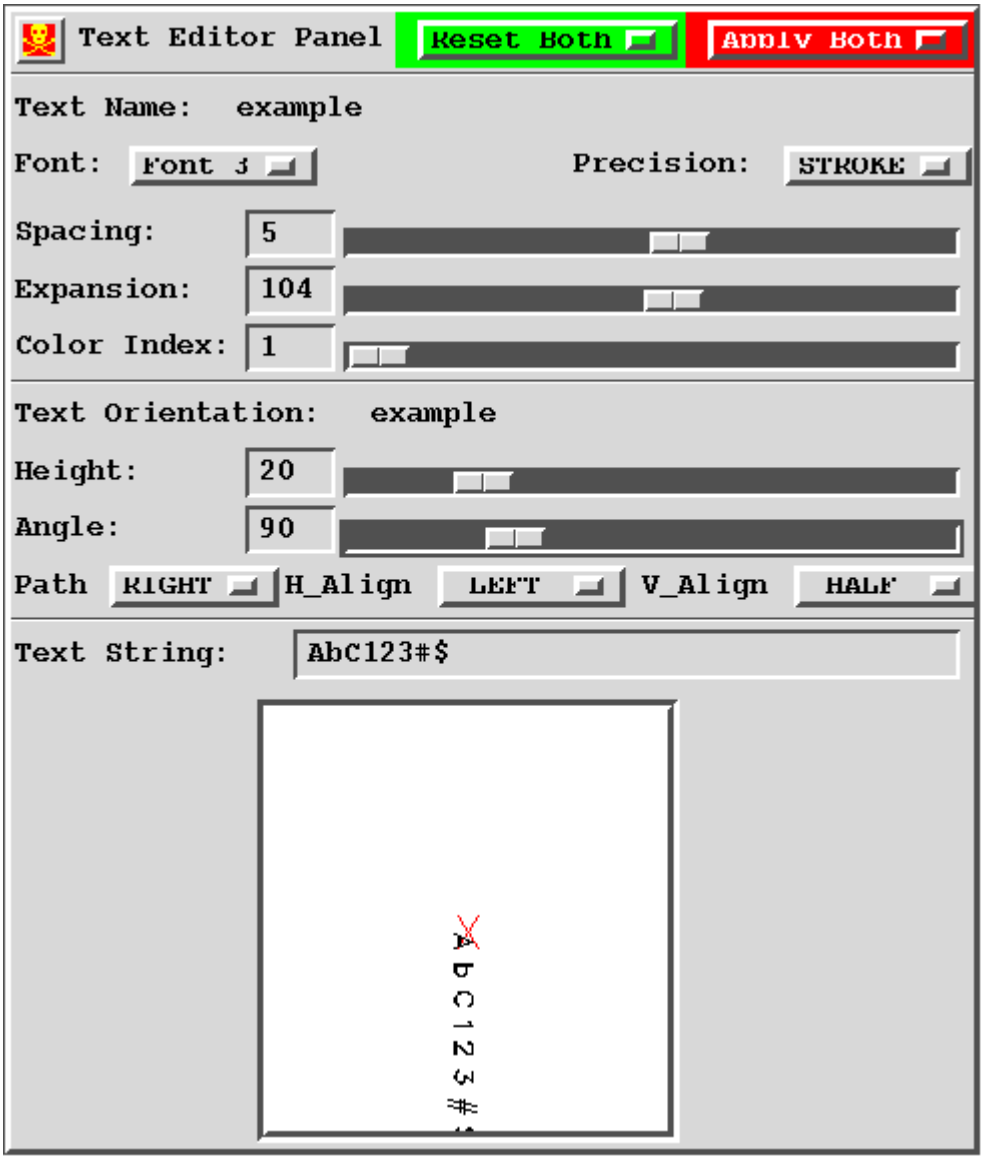
Move the pointer over this Panel's 'Line Type' menu button, pressing and holding the left mouse button. Then move the pointer over the 'DASHED' menu item and release the left mouse button. Next, move the pointer over the 'Line Width' slider, pressing and holding the left mouse button while shifting the slider rightward until the 'Line Width' input text window is greater than '60'. Then move the pointer into the 'Color Index' input text window and click the left mouse button. Change the color index value from '241' to '242', and press the 'Enter' (or 'Return') key (see above figure). To register these line changes on the VCS Canvas, select the red 'Apply' button on the Line Editor Panel.

Step 5: Using the Text Editor Panel



Access the magenta (Tt) Text Table and the orange (To) Text Orientation Table Panels, and create new attribute sets (e.g., 'example') from their respective 'default' sets. Copy the 'example' text attribute set name to the magenta 'Tt' input text windows in the Isoline Value Panel, and copy the 'example' text orientation attribute set name to this Panel's orange 'To' input text windows. Then select the red 'Apply' button to register these changes.

Next, select the 'example' string in the magenta 'Tt' scroll window with the left mouse button, and then the 'example' string in the orange 'To' scroll window. The Text Editor Panel will appear below.



Move the pointer over the 'Font' menu button, pressing and holding the left mouse button while moving over the 'Font 3' menu item--then release the left mouse button. Next, move the pointer over the 'Spacing' slider, pressing and holding the left mouse button while shifting the slider rightward until the 'Spacing' input text window shows a '5' (see above figure).

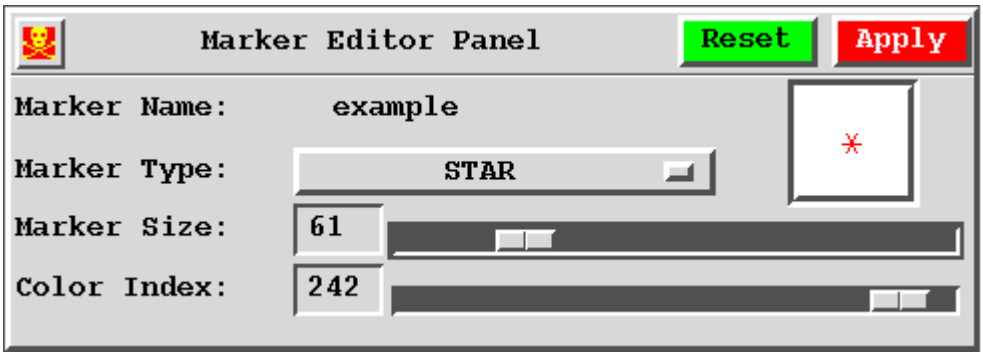
Then move the pointer over the Text Editor Panel's 'Height' slider, pressing and holding the left mouse button while shifting this slider rightward until the 'Height' input text window shows a '15'. Next, move the pointer into the 'Angle' input text window and click the left mouse button. Change the angle value from '0' to '90', and press the 'Enter' (or 'Return') key (see above figure). To register these text and text orientation changes on the VCS Canvas, select the red 'Apply Both' button on the Text Editor Panel.

Step 6: Using the Marker Editor Panel

Access the Yxvsx graphics method (via Main Menu: 'Primary'- 'Graphics Table'- 'Yxvsx') and create a new Yxvsx attribute set (e.g., 'example') from the 'default' attribute set. Then replace the Isoline 'example' attribute set in the blue input text window of the chosen picture descriptor form with this Yxvsx 'example' set.

Next, access the brown (Tm) Marker Table Panel and create a new marker attribute set (e.g., 'example') from the 'default'. Copy this 'example' string to the brown 'Tm' input text window on the Yxvsx Editor Panel, and select the red 'Apply' button to register the change.

Then select this 'example' string with the left mouse button--the Marker Editor Panel will appear below.



Move the pointer over this Panel's 'Marker Type' menu button, pressing and holding the left mouse button while moving over the 'STAR' menu item--then release the left mouse button. Next, move the pointer over the 'Marker Size' slider, pressing and holding the left mouse button while shifting the slider rightward until the value in the 'Marker Size' input text window is greater than '60'. Then move the pointer into the 'Color Index' input text window and click the left mouse button. Change the color index value from '241' to '242' and press the 'Enter' (or 'Return') key (see above figure). To register these marker changes on the VCS Canvas, select the red 'Apply' button on the Marker Editor Panel.

See also Hints on the Line Editor Panel, on the Text Editor Panel, and on the Marker Editor Panel for further details.

VCS Example: Animating Two or More Variables

Description

This example shows how to animate two data attribute sets simultaneously on the VCS Canvas. More data sets can be animated by straightforward extension of procedures illustrated by this example.

Step 1: Creating Two Picture Descriptor Forms

Move the pointer over the 'Picture' menu button on the Page Description Panel and press and hold the left mouse button. Select the 'Create' menu item to set up a new picture descriptor form. Then if only one picture descriptor form is present on the VCS Interface, repeat this process.

Step 2: Specifying Templates

Using the *middle* mouse button, copy the template attribute set 'AMIP_1of2' into the green input text window of the first picture descriptor form. Do the same for the second picture descriptor form, except use template attribute set 'AMIP_2of2'. (See the Example on Creating Plots by Different Graphics Methods for further guidance on specifying template attribute sets.)

Step 3: Specifying the Graphics Method

Using the *middle* mouse button, copy the Boxfill graphics method's 'default' attribute set into the blue input text window of the first picture descriptor form. Do the same for the second picture descriptor form, except use the Isofill graphics method's 'default' attribute set. (See the Example on Creating Plots by Different Graphics Methods for further guidance on specifying graphics method attribute sets.)

Step 4: Specifying the Data

Select the ***example.nc*** file in the Data Selection Panel. Then move the pointer over 'tas' in this Panel's 'Variables' scroll window, and double-click the left mouse button; repeat this process for variable 'psl'. Next, select data

attribute set name ‘tas (3D)’ in the red Data Panel. Using the Data Editor Panel, enter the string ‘months10yr[I]’ in the yellow ‘zfirst’ and ‘zlast’ input text windows, then select the red ‘Apply’ button to save these changes. Repeat these operations for data attribute set name ‘psl (3D)’ in the red Data Panel. (See the Example on Using the Indices Loop Panel for further guidance on editing the data.)

Step 5: Creating Raster Images

Access the Indices Loop Panel and edit its ‘Ith row’s green input text windows as follows. The ‘Loop:’ window should be set to ‘1’, the ‘to’ window should be set to ‘12’, and the ‘by’ window should be set to ‘1’ (i.e., the Ith row should read ‘Loop: 1 to 12 by 1’). Next, select the ‘Raster to file’ toggle button to access the Raster Panel, and enter ‘example3’ in this Panel’s ‘Output File’ text window. Select the green ‘Append’ button to remove the Raster Panel, and then the green ‘Run Loop(s)’ button to create raster images. (See the Example on Using the Indices Loop Panel for further guidance.)

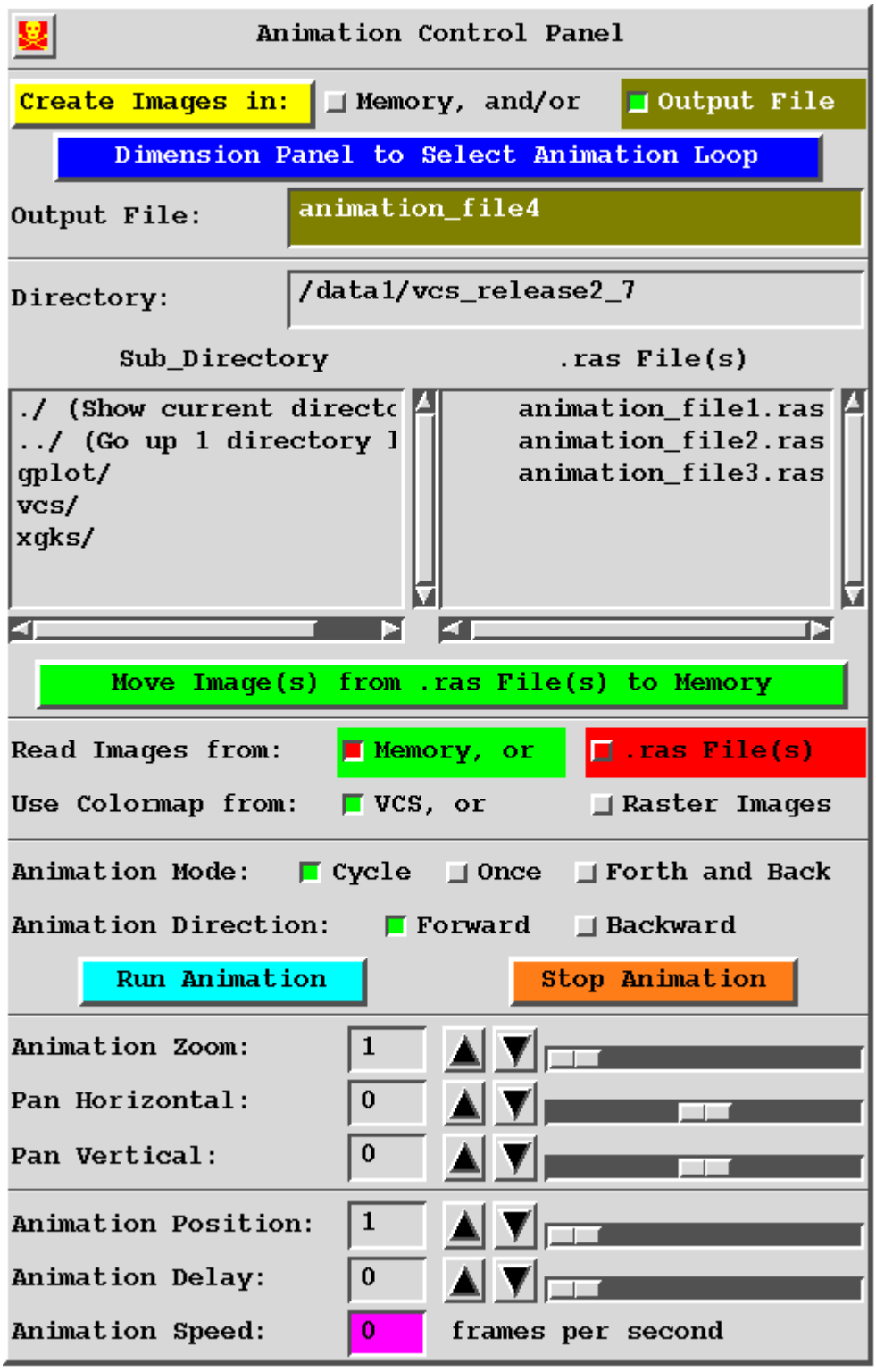
Step 6: Running the Animation

Access the Animation Control Panel and select file ***example3.ras*** from the ‘.ras File(s)’ scroll window. Next, select the green ‘Move Image(s) from .ras File(s) to Memory’ button, and then the cyan ‘Run Animation’ button to start the animation. (See the Example on Quick Animation and Hints on the Animation Control Panel for further guidance.)

3. Hints on VCS Panels

VCS Hints: Animation Control Panel

Access: via Main Menu - ‘Animation’ - ‘Animation Control Panel’



The Animation Control Panel is used to create sequences of raster images in memory or in an output file (i.e.,

'filename.ras'). Once raster images are created, their animation can be viewed subject to user control.

How to Use the Animation Control Panel

Before the Animation Control Panel is accessed, there must be at least one plot of data having three or more dimensions displayed on the VCS Canvas. (An unlimited number of plots can be animated, but they all must use the same data variable. To create a raster file for animation of more than one data variable, see Hints on the Indices Loop Panel and on the Data Editor Panel.) Once this condition is satisfied, use the Animation Control Panel to select whether to create images in 'Memory' and/or in an 'Output File'. If the 'Output File' toggle button is selected, an input text window will appear below to receive the output file name. Select the yellow 'Create Images in' button to begin saving raster images. When saving is completed, this button will turn red and display 'Stop Creating:'. Select the 'Stop Creating:' button to stop saving raster images at any time.

Moving Raster Files into Memory:
In the '.ras File(s)' scroll window, select the raster file that is desired first in memory by moving the pointer over the raster file name and clicking the left mouse button. Then select raster files 2, 3, etc. in the same manner. The order of raster files in memory will be designated by a '1', '2', '3', etc. that is prepended to each raster file name. To remove a raster file from the sequence list, reselect the raster file name; the prepending number will be removed and the list will reorder itself. After selecting the desired files, press the green 'Move Image(s) from .ras File(s) to Memory' button to move the raster file images into memory.

Reading Images from Memory or from Raster Files:
If images are saved in memory or raster files images are moved into memory, the 'Read Images from:' toggle is automatically set to 'Memory'. To read images from raster files, select the files to be animated in the '.ras File(s)' scroll window, and set the 'Read Images from:' toggle to '.ras File(s)'.

Setting the Animation Colormap:
If the 'Use Colormap from:' toggle is set to 'VCS', then VCS controls the colormap. In this state, the Colormap Editor/Table Panel can be accessed, and color indices can be modified while animation is proceeding. If instead the 'Use Colormap from:' toggle is set to 'Raster Images', then the colormap stored with each image is used.

Setting the Animation Mode:
If the 'Animation Mode:' is set to 'Cycle', then the sequence of images will be repeated regularly, as in a loop. If the 'Animation Mode:' is set to 'Once', then each image is displayed after animation stops. If the 'Animation Mode:' is set to 'Forth and Back', animation proceeds to the end of the sequence of images, and then reverses direction.

Running or Stopping Animation:
Once the images are loaded into memory or the raster files containing images are selected (see above), the user can select the 'Read Images from:' toggle to be either 'Memory' or '.ras File(s)'. Then select the cyan 'Run Animation' button to start the animation. To stop the animation, select the orange 'Stop Animation' button.

Zooming in on Animation:
There are several ways to zoom in on an animation: move the 'Animation Zoom' slider, or select the 'Animation Zoom' up and down arrows, or enter a higher magnification number into the 'Animation Zoom' input text window. (The maximum allowed magnification number is 20 and the minimum is 1.)

Panning an Animation:
There are several ways to pan an animation in the horizontal or vertical direction: move the appropriate 'Pan Horizontal/Vertical' slider, or push the 'Pan Horizontal/Vertical' up and down arrows, or enter the desired number into the 'Pan Horizontal/Vertical' input text window. (The maximun allowed pan number is 100 and the minimum is -100.)

Controlling Animation Position, Delay, and Speed:
The 'Animation Position' input text window shows the image frame that is being displayed. If animation is stopped, the 'Animation Position' slider can be moved or the 'Animation Position' up and down arrow buttons can be pushed to view a particular frame. The animation delay is controlled by the 'Animation Delay' slider or up/down arrow buttons: the higher the delay number, the slower the speed. The 'Animation Speed' indicator shows the number of

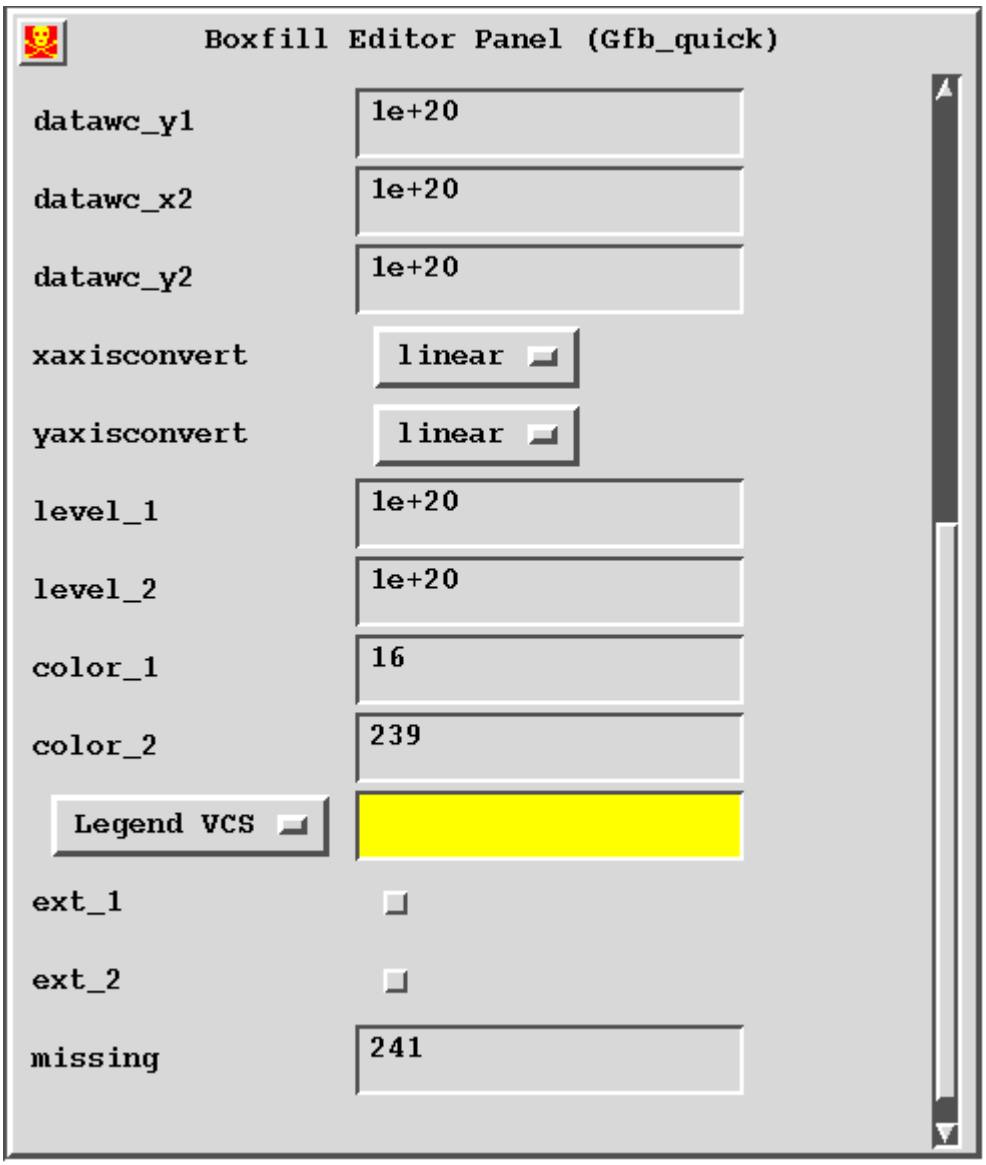
frames being viewed per second.

Setting Up the Dimensions for Animation Loop:
To select the desired dimension values for animation, move the pointer over the blue Dimension Panel to the 'Select Animation Loop' button and click the left mouse button. The Dimension Manipulation Panel will appear, allowing the user to reverse, stride, or select dimension values.

Changing the Animation Directory:
Type the desired directory in the 'Directory' input text window. Press the 'Return' or 'Enter' key to register the end of typing. The 'Sub_Dir' scroll window and possibly also the '.ras File(s)' scroll window will change. (If the specified directory does not exist, the current directory will reappear.) The directory can also be changed by moving the pointer over a directory name in the 'Sub_Directory' scroll window and clicking the left mouse button.

VCS Hints: Boxfill Editor Panel

Access: via Boxfill Graphics Method Panel - Attribute Set Name



The Boxfill Editor Panel displays the attribute set names and assignment values of the boxfill graphics method. The boxfill graphics method displays a two-dimensional data array by surrounding each data value by a colored grid box.

How to Use the Boxfill Editor Panel

Changing the Map Projection:
Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button to register changes.

Setting a List Name for Labels and Tick Marks:
Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks; 'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new attribute set name into the yellow input text window.

Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

Converting the X-, Y-axis:
The x- and y-axis for the boxfill graphics method can be changed from linear (the default setting) to: log base 10 (log10), natural log (ln), exponential (exp), or area weighted (area_wt). Move the pointer over the 'xaxisconvert' or 'yaxisconvert' menu button and press and hold the left mouse button. Then move the pointer over the desired axis transformation and release the left mouse button. Select the red 'Apply' button to register changes.

Setting Levels:
Set the levels by changing 'level_1' and 'level_2' input text windows. If 'level_1' or 'level_2' is set to '1e+20', then VCS will select the levels.

Setting Colormap Range:
Set the color range by changing 'color_1' and 'color_2' input text windows. (The colormap ranges from 0 to 255, but only color indices 0 through 239 can be changed.) See Hints on the Colormap Editor/Table Panel for procedures to select and modify the colormaps.

Setting Legend Values:
The boxfill legend labels and line marks can be produced in three different ways: 'Legend VCS'--VCS generates appropriate legend values; 'Legend Pts'--a list of legend values is generated, given the number of intervals and the start and end legend points; and 'Legend List'--a given list of values is used to specify legend values.

Note, the legend values that are specified or generated outside the minimum and maximum value range (or the specified level_1 and level_2 value range) will not be displayed.

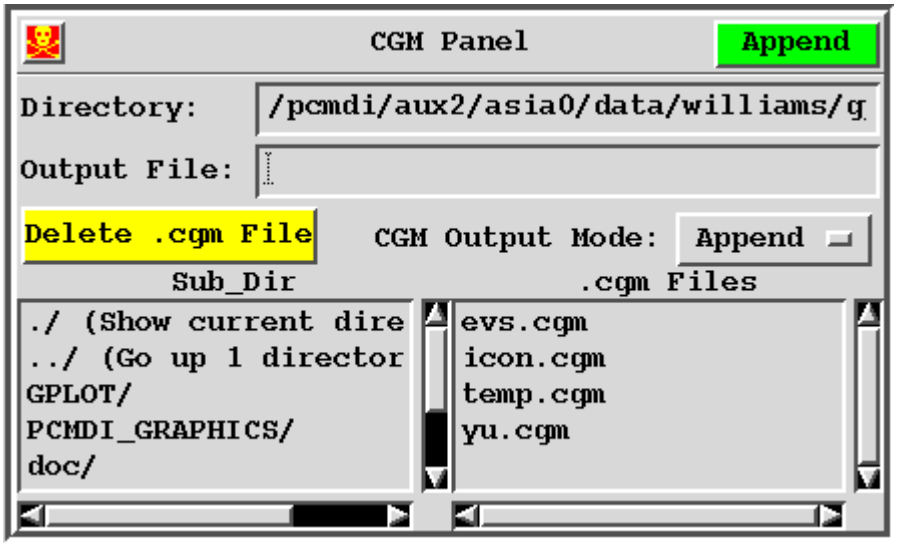
Showing Extended Values:
If the minimum data value is less than the 'level_1' value and 'ext_1' toggle button is not set (i.e., not depressed), then all data values less than the 'level_1' value are not displayed. If 'ext_1' toggle button is set (i.e., depressed), then the values less than 'level_1' are given 'color_1' color index value and are displayed. If the maximun data value is greater than the 'level_2' value and 'ext_2' toggle button is not set (i.e., not depressed), then all data values greater than the 'level_2' value are not displayed. If 'ext_2' toggle button is set (i.e., depressed), then the values greater than

'level_2' are given 'color_2' color index value and are displayed.

Showing Missing Data:
The color index value for missing data is specified by setting the 'missing' input text window. The minimum color index value is 0 and the maximum color index value is 255. See Hints associated with the Colormap Editor/Table Panel for details on changing color indices.

VCS Hints: CGM Panel

Access: via Main Menu - 'File' - 'Save CGM'



The CGM Panel is used to save or delete a cgm file. There are two modes for saving a cgm file: 'Append' mode appends cgm output to an existing cgm file; 'Replace' mode overwrites an existing cgm file with new cgm output.

How to Use the CGM Panel

Changing the CGM Directory:
Type the desired directory in the 'Directory' input text window. Press the 'Return' or 'Enter' key to register the end of typing. The 'Sub_Dir' scroll window and possibly also the '.cgm Files' scroll window will change. (If the specified directory does not exist, the current directory will reappear.)The directory can also be changed by moving the pointer over a directory name in the 'Sub_Dir' scroll window and clicking the left mouse button.

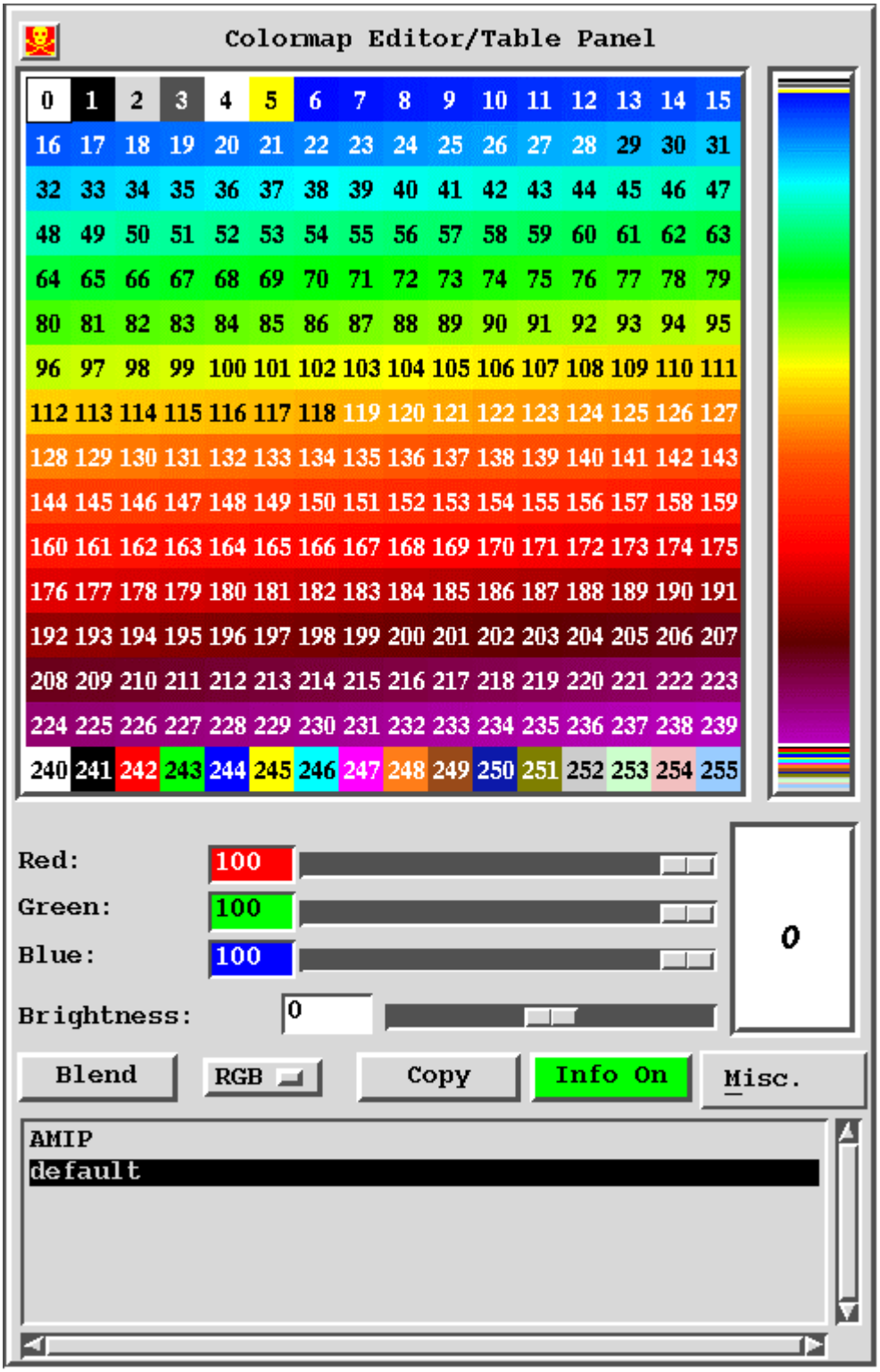
Selecting a CGM File:
Move the pointer over the desired cgm file name in the '.cgm File' scroll window and click the left mouse button. The 'Output File' input text window will display the selected cgm file.

Deleting a CGM File:
Move the pointer over the desired CGM file name in the '.cgm File' scroll window and click the left mouse button. Then move the pointer over the red 'Delete CGM File' button, and click the left mouse button.

Changing the CGM Output Mode:
Move the pointer over the 'CGM Output Mode:' button, and press and hold the left mouse button. Move the pointer over 'Append' or 'Replace' and release the left mouse button. The green button in the upper right corner will change, showing the toggle selection

VCS Hints: Colormap Editor/Table Panel

Access: via Main Menu - 'Basic' - 'Colormap Editor/Table'



The Colormap Editor/Table Panel is used to create and modify colormaps. It contains 256 color indices, a color spectrum bar, Red-Green-Blue (or, on option, Cyan-Magenta-Yellow) color sliders, a color index viewer and reset button, a brightness slider, a blend button, a color model menu button, a copy button, an info button, a miscellaneous pulldown menu button, and a scroll list of colormap names. VCS treats colormap attributes as one of the eight secondary elements making up the three primary elements (template, graphics method, and data). *Note: A color index cannot be selected if the colormap is specified as 'default'or if the color index is greater than 240.*

How to Use the Colormap Editor/Table Panel

Selecting and Modifying a Color Index:
Move the pointer over one of the indices 0 through 239, and select with the left mouse button. The selected color index can then be modified with the 'Red', 'Green', and 'Blue' sliders. To reset the color index, select the button to the right of the corresponding slider. (Color indices 240 through 256 are reserved for VCS internal use.)

Changing the Color Model:
There are currently two color models available in VCS: the Red-Green-Blue (RGB) and the Cyan-Magenta-Yellow (CMY) color models. To change from the RGB color model to CMY, move the pointer to the 'RGB' menu button (located below the 'Brightness' input text window. Press and hold the left mouse button, then move the pointer over the 'CMY' menu item and release the left mouse button. Note that the 'Red', 'Green', and 'Blue' labels are replaced by 'Cyan', 'Magenta', and 'Yellow' respectively.

Blending Colors:
To blend colors, select a lower color index with the left mouse button and an upper color index with the middle mouse button, and modify the colors of each index as desired. Then select the 'Blend' button to change the colors of intermediate indices by progressively blending the colors of the lower and upper indices.

Copying and Pasting Color Indices:
To copy a range of color indices, select the first color index with the left mouse button, then select the second color index with the middle mouse button. To paste this range of color indices, move the pointer to the desired position, then click the right mouse button.

Copying/Renaming a Colormap:
Select a colormap name from the scroll window list, then select the 'Copy' button. An input text window will appear in which a new colormap name can be specified.

Displaying Color Index Value Range Infomation:
The green 'Info On' button will show color index value ranges only for the Boxfill graphics method. In that case, if the color index selected with the left or the middle mouse button is within the data range, then the VCS Message Panel (located below the Main Menu) will show a value range for the color index.

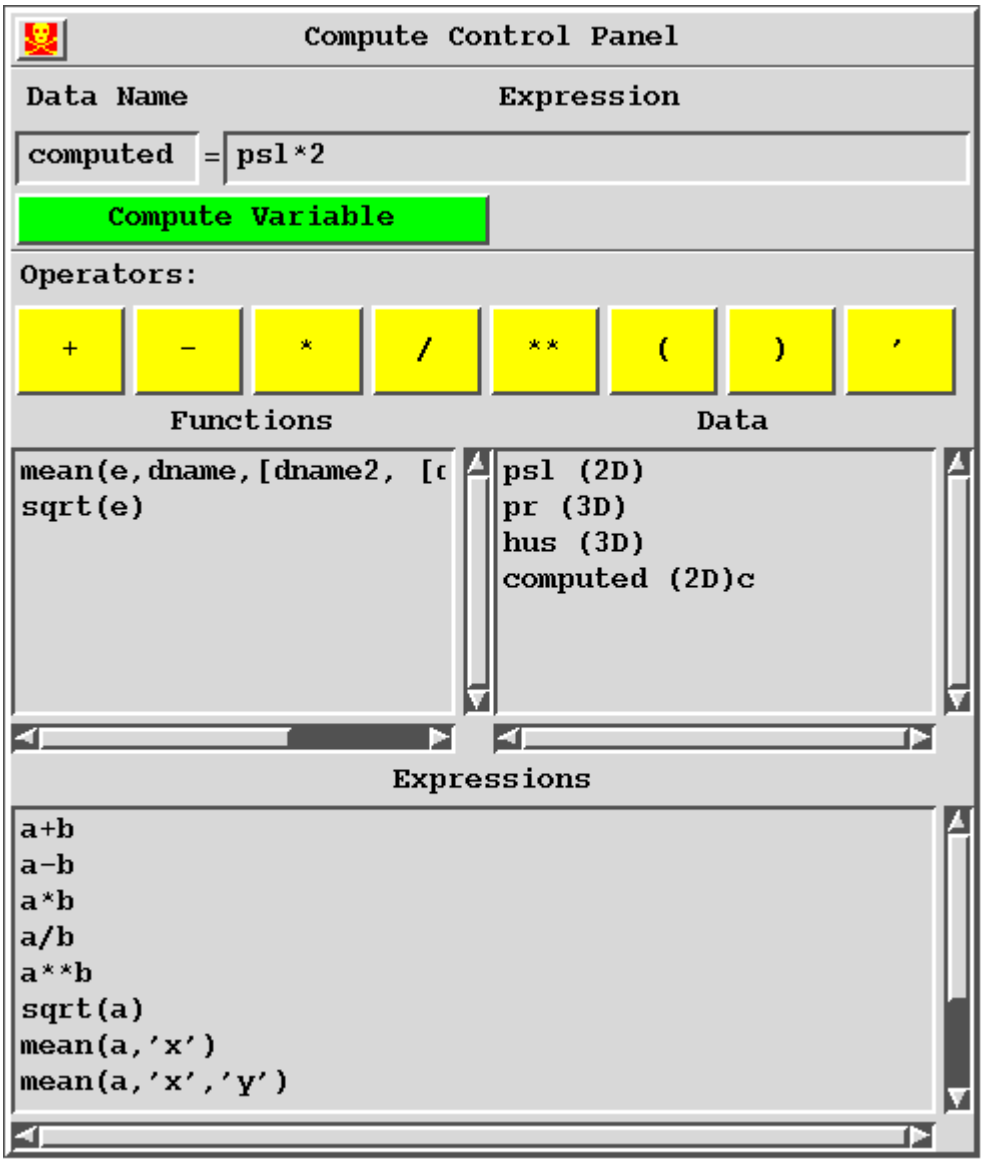
Deleting a Colormap:
Select a colormap name from the scroll window list, then move the pointer over the 'Misc.' pulldown menu button and select and hold the left mouse button. While holding the down the left mouse button, move the pointer over the

'Delete' menu item and release the left mouse button. A popup panel will appear to confirm deletion of the colormap.

Saving the Individual Colormap to a Script File:
Select a colormap name from the scroll window list, then move the pointer over the 'Misc.' pulldown menu button and press and hold the left mouse button. While holding down the left mouse button, move the pointer over the 'Script' menu item and release the left mouse button--a 'Save Colormap Script' popup window will appear. Enter the name of the colormap script and hit the 'Return' (or 'Enter') key, or select the the 'Save Script' button to save the colormap to a script file that will be located in the $HOME/PCMDI_GRAPHICS directory.

VCS Hints: Compute Control Panel

Access: via Main Menu - 'Compute' - 'Compute Control Panel'



The Compute Control Panel is used to compute new data variables. In order to perform computations, data variables must be visible in the Data Panel (see Hints on the Data Panel and on the Data Selection Panel).

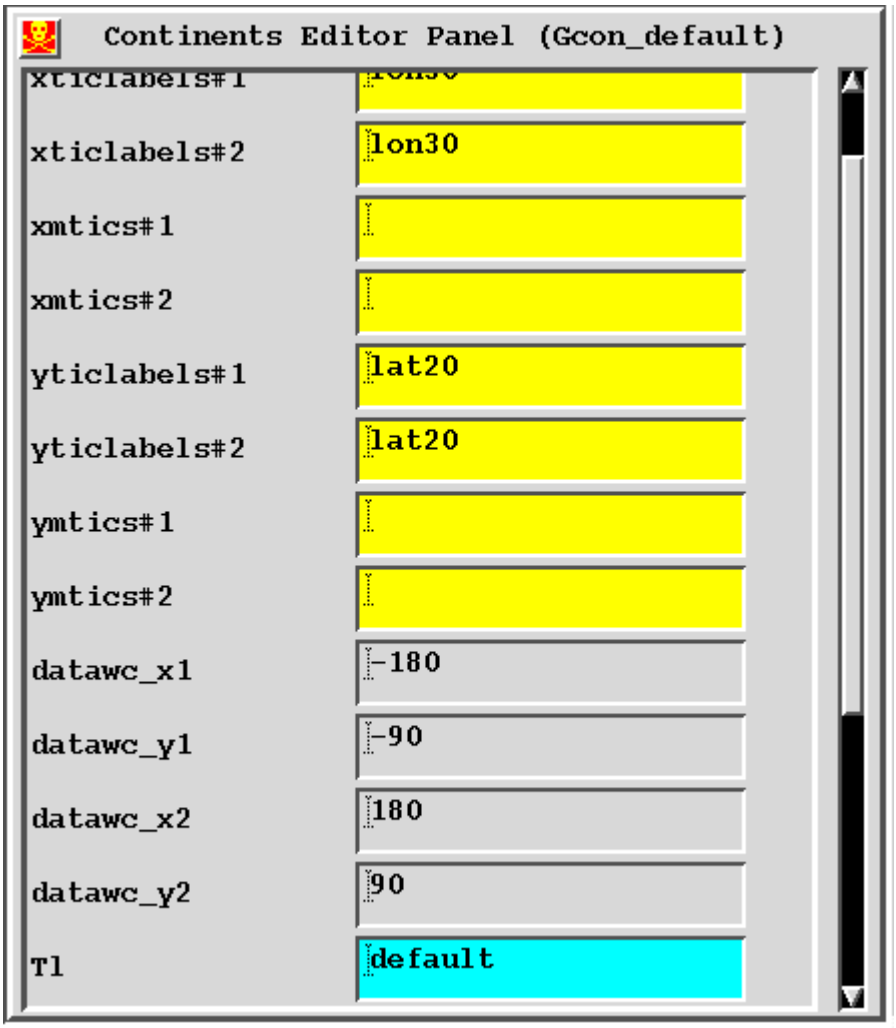
How to Use the Compute Control Panel

Specifying New Data Name and Expression:
Move the pointer into the 'Data Name' input text window and click the left mouse button. Enter the new data name. Then move the pointer into the 'Expression' input text window and click the left mouse button. Enter the desired expression. (The available 'Operators', 'Functions', 'Expressions' and 'Data' are listed. Selection of a particular operator, function, expression, or data will place it in the 'Expression' input text window.)

Computing a Variable:
Once the desired selections are visible in the 'Data Name' and 'Expression' input text windows (see above), select the green 'Compute Variable' button. The computed data variable name will be displayed in the red Data Panel (located above the Compute Control Panel), where a 'c' appended to the name confirms completion of the computation.

VCS Hints: Continents Editor Panel

Access: via Continents Graphics Method Panel - Attribute Set Name



The Continents Editor Panel displays the continents graphics method attribute set names and assignment values. The

continents graphics method displays a predefined, generic set of continental outlines in a longitude by latitude space.

How to use the Continents Editor Panel

Changing the Map Projection:
Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button to register changes.

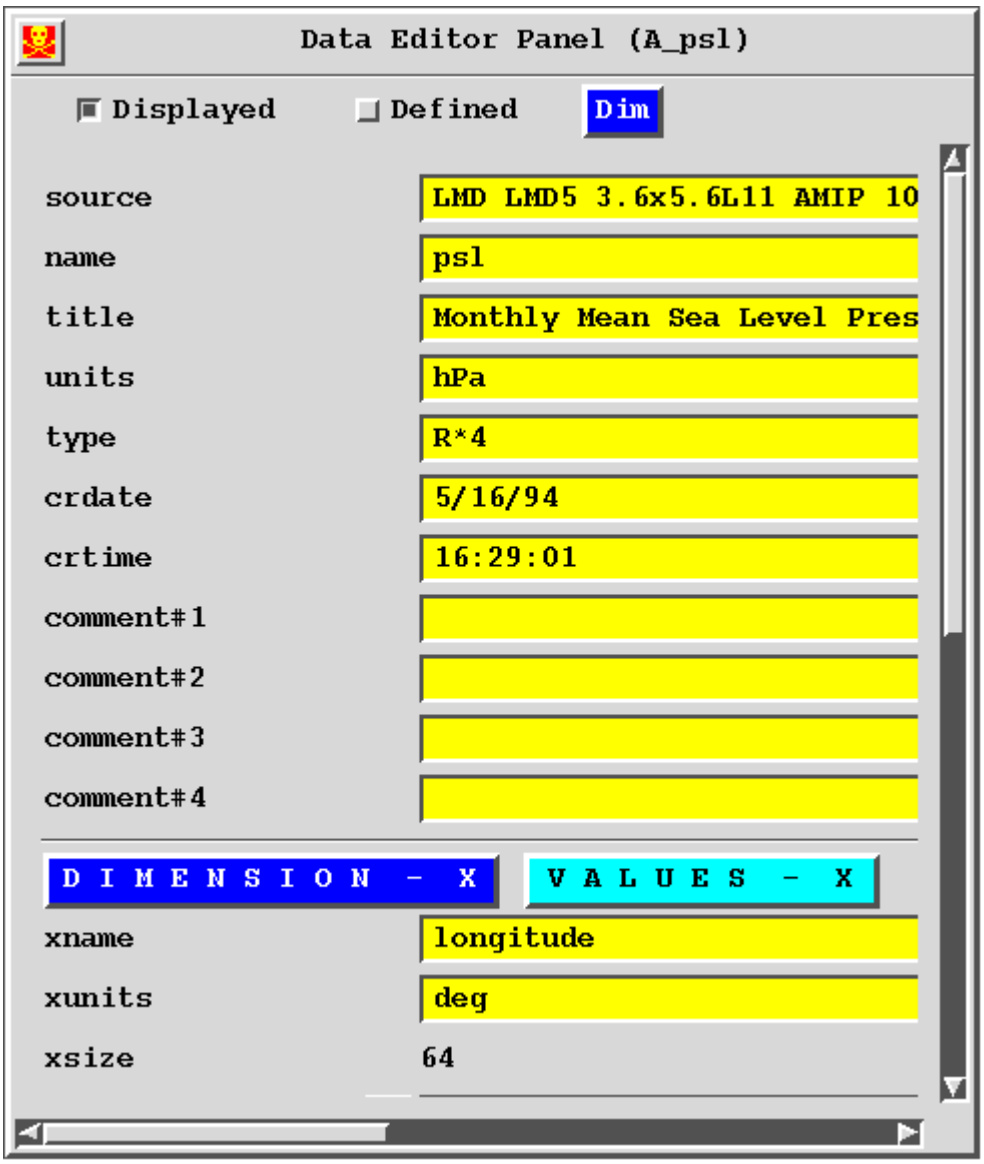
Setting a List Name for Labels and Tick Marks:
Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks; 'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new name into the yellow input text window.

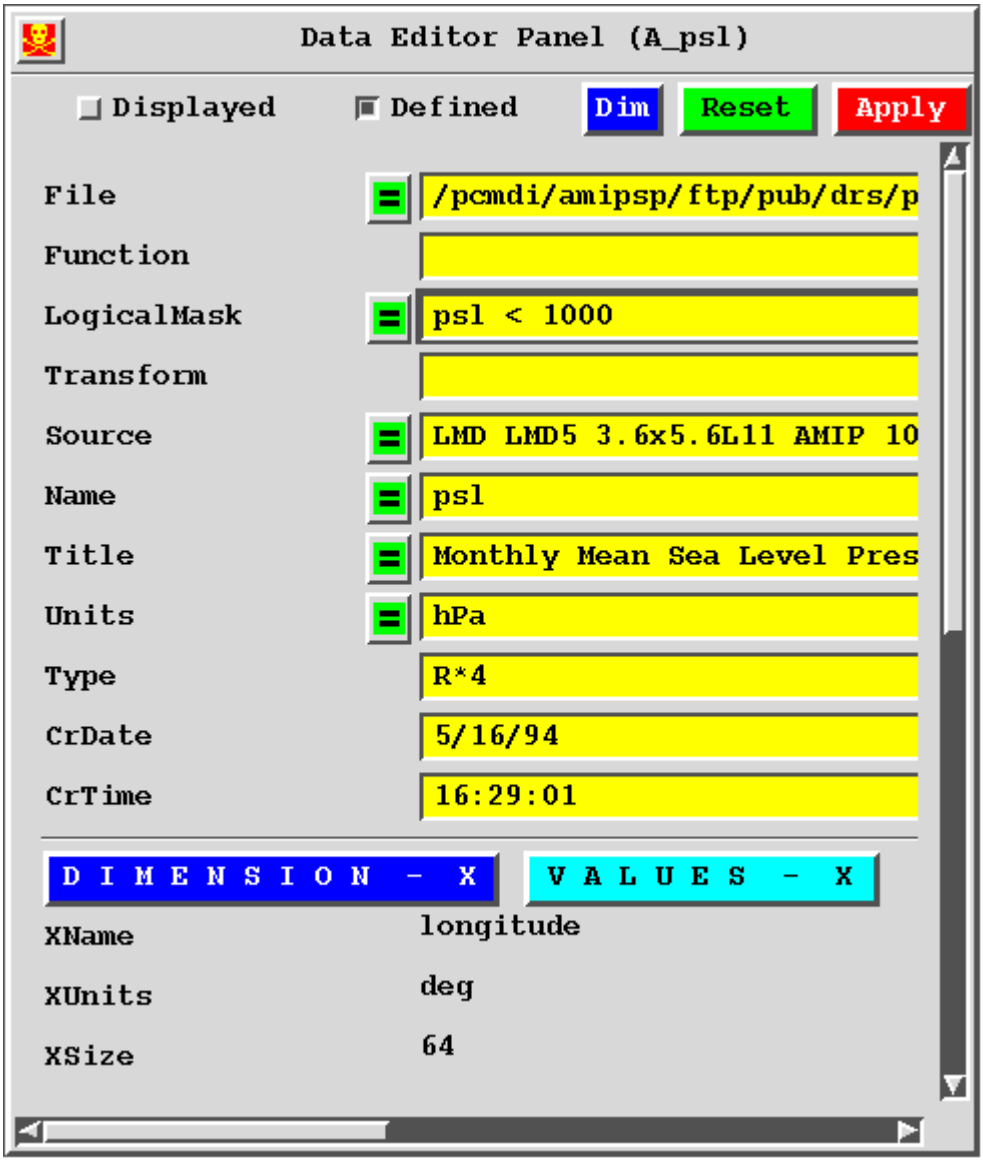
Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

Changing Line Type:
To change the continents line type, access the (Tl) Line Table Panel (via Main Menu - 'Basic' - 'Line Table (Tl)'). To copy a line type, move the pointer to the desired line attribute set name and click the *middle* mouse button. To drop, move the pointer to the cyan 'Tl' input text window on the Continents Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

VCS Hints: Data Editor Panel

Access: via Data Panel - Attribute Set Name


Data Editor Panel (A_psl)
Displayed
Defined
Dim
source
LMD LMD5 3.6x5.6L11 AMIP 10
name
psl
title
Monthly Mean Sea Level Pres
units
hPa
type
R*4
crdate
5/16/94
crtime
16:29:01
comment#1
comment#2
comment#3
comment#4
D I M E N S I O N - X
V A L U E S - X
xname
longitude
xunits
deg
xsize
64



The Data Editor Panel lists a 'Displayed' and a 'Defined' array data attribute set. The 'Displayed' attribute set represents what will be displayed on the VCS Canvas, while the 'Defined' attribute set defines the data variable.

How to Use the Data Editor Panel

Viewing the 'Displayed' or 'Defined' Data Attribute Set:
At the top of the Data Editor Panel there are two toggle buttons--'Displayed' and 'Defined'. Select 'Displayed' to view the displayed array data attribute set, or select 'Defined' to view the defined array data attribute set.

Changing an Input Text Window:
To change a yellow input text window, move the pointer into the window and click the left mouse button. If the text is modified, a green equal sign appears, representing an assignment (i.e., 'source' = 'user-specified text statement'). When modifying an input text window, 'Reset' and 'Apply' buttons appear in the upper right corner. Select 'Reset' to restore the currently modified input text window to its original statement. If the green equal sign is selected, the message '****Apply to See New String*****' will appear. Then, if the red 'Apply' button is selected, the defined

data attribute set string will appear in the yellow input text window.

Entering a List Name in an Input Text Window:
Access the List Table Panel (via Main Menu - 'Basic' - 'List Table') and move the pointer into the yellow 'Lists' scroll window. To copy a list, select the desired list attribute set name using the *middle* mouse button. To drop, move the pointer to the desired yellow input text window in the Data Editor Panel and click the *middle* mouse button. The selected list attribute set name will appear in the input text window.

Accessing the Dimension Manipulation Panel:
Select the blue 'Dim' button at the top of the Data Editor Panel to access the Dimension Manipulation Panel. Then, to view the desired dimension column and coordinate values, select the blue 'DIMENSIONS- ?' button (where '?' represents dimension X, Y, Z, etc.).

Accessing the Dimension Assignment Panel:
Select the cyan 'VALUES - ?' button (where '?' represents dimension X, Y, Z, etc.) to access the Dimension Assignment Panel.

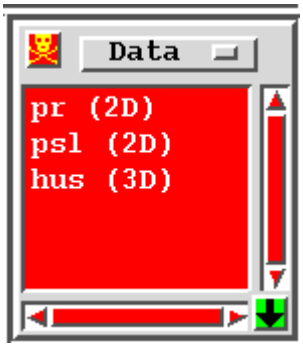
Assigning a Function:
Select the 'Defined' toggle button at the top of the Data Editor Panel. This will display the defined array data attribute set. In the yellow 'Function' input text window, enter the desired function (e.g., "hus*2"). Select the red 'Apply' button to register function change. Computing a data variables can also be done in the Compute Control Panel. See this panel for the available 'Operators', 'Functions', 'Expressions' and 'Data'. Note: if a functional assignment statement exists, then it will override any 'File' assignment.

Setting a Logical Mask:
Select the 'Defined' toggle button at the top of the Data Editor Panel. This will display the defined array data attribute set. In the yellow 'LogicalMask' input text window, enter the desired logical assignment statement for masking out data. The operators that can be used in the logical assignment statement are: greater than (), less than (<), equal (=), greater than or equal (=), and less than or equal (<=). Example: if the variable 'psl' data ranges from 990 to 1030, all data values greater than 1000 can be masked out by entering: 'LogicalMask' = 'psl < 1000'.

Setting a Grid Transformation:
Select the 'Defined' toggle button at the top of the Data Editor Panel. This will display the defined array data attribute set. In the yellow 'Transform' input text window, enter the desired grid transformation list name. Example: 'Transform' = 'transformation name (dimension name,...)', ... The grid transformation can also be done with the Dimension Assignment Panel. Select the cyan 'VALUES' button located below in this panel to bring up the Dimension Assignment Panel.

VCS Hints: Data Panel

Access: via Main Menu - 'Primary' - 'Data Table'



The Data Panel lists array data sets which are selected with the Data Selection Panel and are displayed on the VCS Canvas. VCS treats the data as one of the three primary elements.

How to use the Data Panel

Selecting a Data Attribute Set:
Move the pointer over the desired data attribute set name and click the left mouse button. The Data Editor Panel then will appear below.

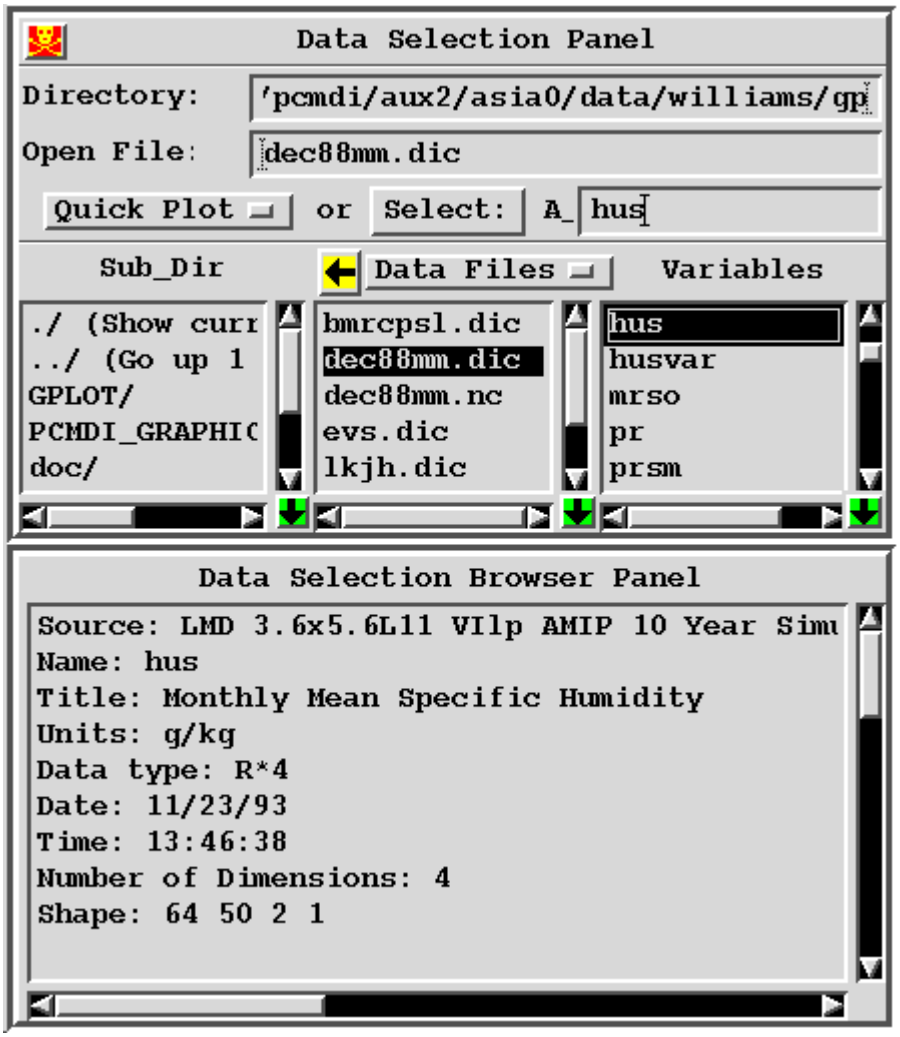
Copying and Dropping a Data Attribute Set
To copy a data attribute set, move the pointer over the data attribute set name and click the middle mouse. To drop, move the pointer to the red text window on the Page Description Panel (located above the Data Panel), and click the middle mouse button.

Removing a Data Attribute Set:
Move the pointer over the data attribute set name to be removed and click the right mouse button.

Using the 'Data' Menu Button:
Pressing the 'Data' button displays a menu that allows the user to 'Select', 'Copy', 'Rename', 'Script', or 'Remove' a data attribute set.

VCS Hints: Data Selection and Data Selection Browser PanelS

Access: via Main Menu - 'File' - 'Select Data'



The Data Selection Panel is used for selecting data. The Data Selection Browser Panel displays the attributes of a data variable, including dimension information.

How to Use The Data Selection and Data Selection Browser Panels

Changing Directories:
To change directories, type the desired directory in the 'Directory' input text window, and press the 'Return' or 'Enter' key to register the end of typing. The 'Sub_Dir' scroll window and possibly also the 'Data Files' scroll window will change. (If the specified directory does not exist, the current directory will reappear.) *(Note, VCS recognizes the C shell tilde ~ convention as designating the home directory.*) The directory can also be changed by moving the pointer over a directory name in the 'Sub_Dir' scroll window and clicking the left mouse button.

Selecting a Data File:
Move the pointer over the desired data file name in the 'Data File' scroll window and click the left mouse button. A list of variable names will appear in the 'Variables' scroll window.

Viewing a Variable:
Move the pointer over a data variable name and click the left mouse button. Information showing the data variable's attributes (including dimension information) will appear below in the 'Data Selection Browser Panel'.

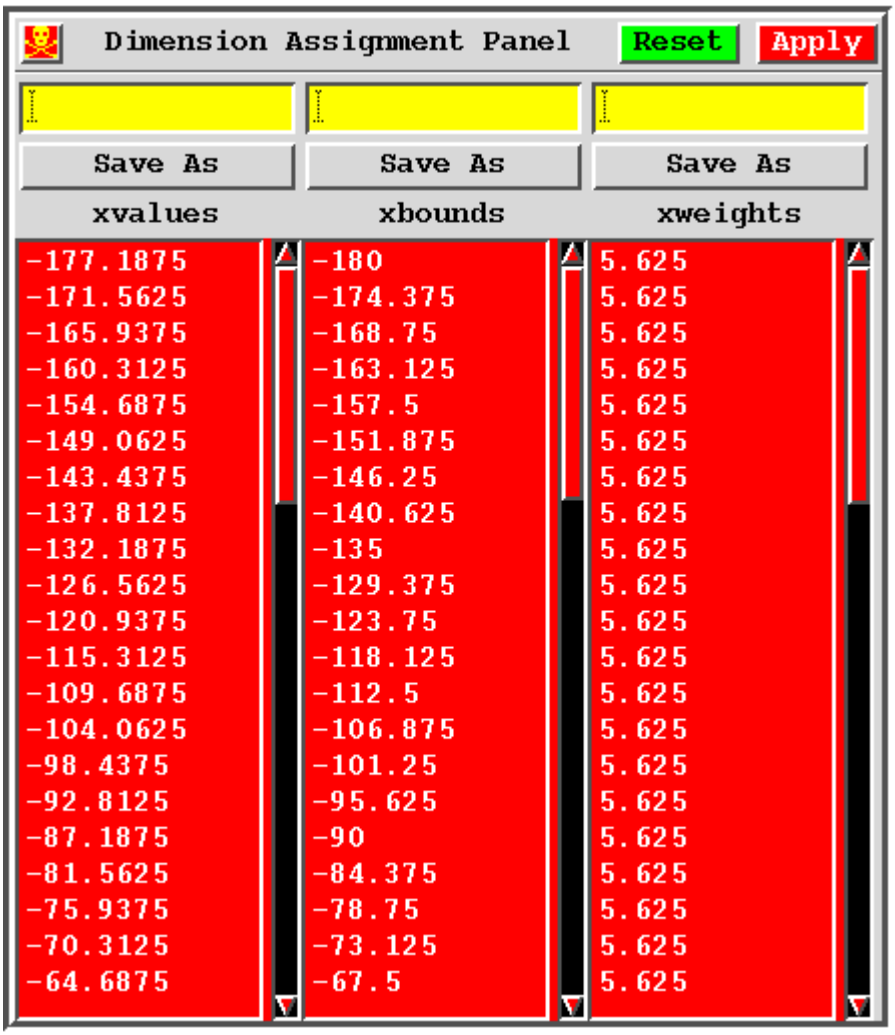
Quick Plotting a Data Variable:
Move the pointer over the desired data variable name and click the left mouse button. Then move the pointer over the 'Quick Plot' button and press and hold the left mouse button. An assortment of graphics methods will appear. Select a graphics method by moving the pointer over the desired method and releasing the left mouse button. A plot of the data variable will appear on the VCS Canvas to the left.

Placing Data Variables in the Data Panel:
Move the pointer over a data variable name and double-click the left mouse button. The data variable name will appear in the red 'Data' scroll window above.

Changing the Name of the Selected Data Variable:
Move the pointer over the data variable name and click the left mouse button. The variable name will appear above in the 'A_' input text window. Modify the name and press the 'Select:' button to the left. The new data variable name will appear in the red 'Data' scroll window above.

VCS Hints: Dimension Assignment Panel

Access: via Data Editor Panel - 'VALUES - ' button



The Dimension Assignment Panel displays dimension coordinate values, bounds, and weights, and can be used to create lists that are displayed in the List Table Panel. With the Dimension Assignment Panel, the data attribute set also can be transformed to a different grid.

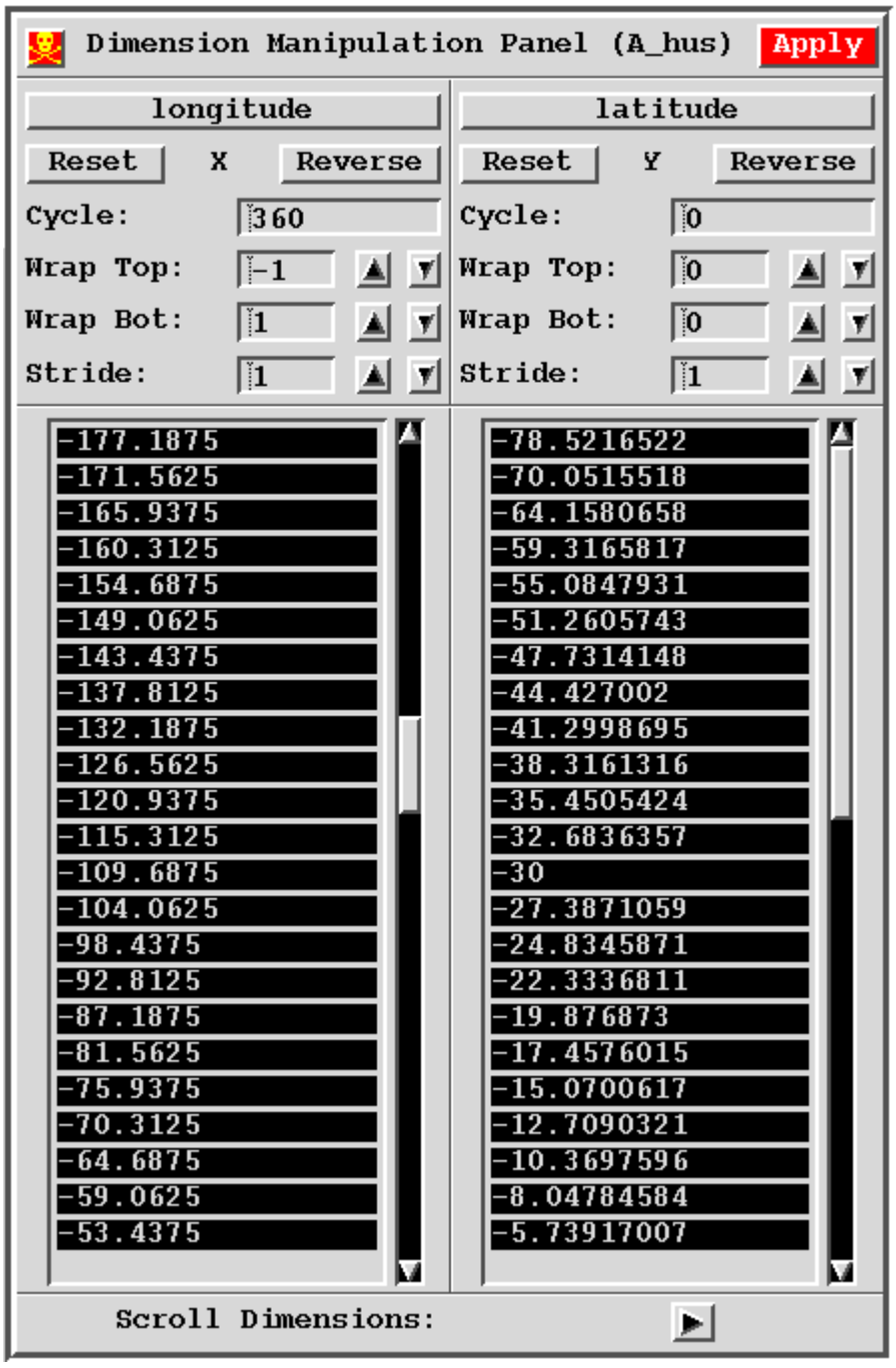
How to Use the Dimension Assignment Panel

Creating a List Attribute Set:
Position the pointer over the 'Save As' button of the list category to be created (i.e., xvalues, xbounds, xweights, etc.) and click the left mouse button--an input text window appear. Enter the new list attribute set name and select 'Save' to create the list or 'Cancel' to cancel the operation. The new list attribute set name will be visible in the List Table Panel.

Transforming a Grid:
Access the List Table Panel (via Main Menu - 'Basic' - 'List Table'). Move the pointer over the list attribute set name of the desired grid and click the *middle* mouse button to copy the list. Then move the pointer to the desired yellow input text window on the Dimension Assigment Panel and click the *middle* mouse button to drop the list. Select the red 'Apply' button to view changes.

VCS Hints: Dimension Manipulation Panel

Access: via Data Editor Panel - 'DIMENSION - ' button



The Dimension Manipulation Panel displays a column for each dimension that is defined in the array data attribute set. This panel can be used to transpose or reverse dimensions, set the cycle value used in wrapping a dimension's top or bottom, stride a dimension's coordinate values, and reset a dimension's original values.

How to Use the Dimension Manipulation Panel

Selecting Top Dimension Coordinate Value:
The dimension scroll window lists the dimension's coordinate values. Move the pointer to the desired top value and click the left mouse button. The selected value will be highlighted.

Selecting Bottom Dimension Coordinate Value:
Move the pointer to the desired bottom value in the dimension scroll window and click the *middle* mouse button. The selected value will be highlighted.

Toggling Dimension Values:
Move the pointer to the desired value in the dimension scroll window and click the *right* mouse button. The selected value will be highlighted. Follow the same procedure to deselect a dimension's coordinate value.

Transposing Dimensions:
To transpose dimensions, move the pointer over the dimension name button (i.e., longitude, latitude, etc.) and click the left mouse button--a scroll window displaying other dimension names will appear. Move the pointer over the desired dimension name and click the left mouse button. The current dimension and the selected dimension will then be transposed.

Reversing the Dimension Coordinate Values:
Move the pointer over the 'Reverse' button and click the left mouse button. The listed coordinate values, displayed below in the scroll window, will be shown in reverse order.

Setting the Dimension Cycle Value:
The dimension cycle value is used in wrapping a dimension--e.g. the longitude dimension has a cycle value of 360 (i.e., 0 and 360 are the same coordinate point). To set the cycle value, move the pointer into the 'Cycle' input text window and click the left mouse button. Then enter the desired cycle value.

Wrapping Top or Bottom Dimension Values:
The 'Wrap Top' or 'Wrap Bot' input text windows allow wrapping of a dimension multiple times prior to selecting top and bottom coordinate values. To wrap, move the pointer into the input text window and click the left mouse button. Then enter the desired value followed by a 'Return'. The arrow buttons can also be used to set the desired wrap values.

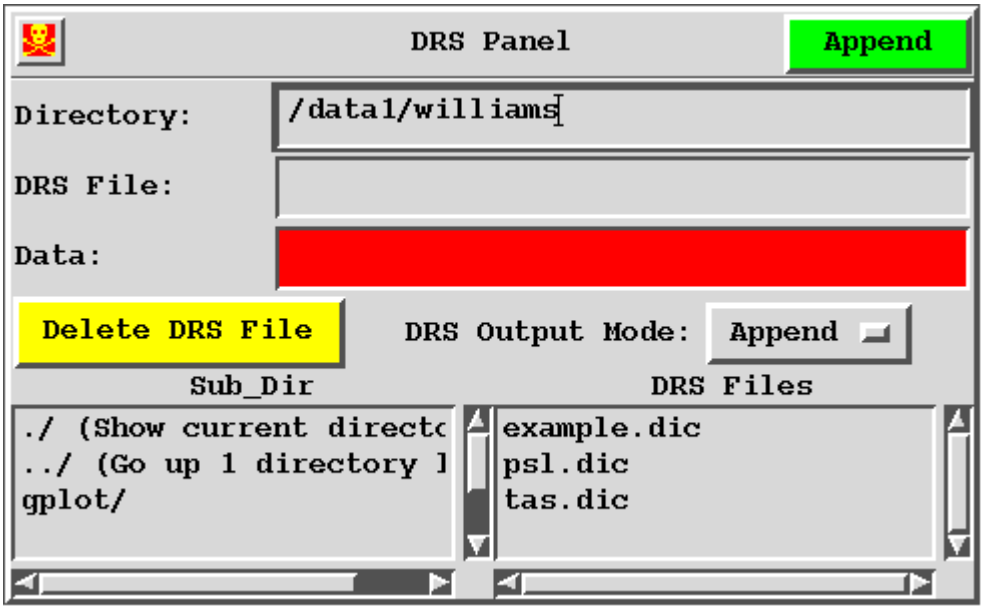
Striding the Dimension Coordinate Values:
To stride the dimension coordinate, move the pointer into the 'Stride' input text window and click the left mouse button. Then enter the desired stride value followed by a 'Return'. The arrow buttons can also be used to set the desired stride.

Resetting the Dimension Values:
To reset the dimension column, select the 'Reset' button.

Viewing Hidden Dimensions:
To view hidden dimensions, move the pointer to 'Scroll Dimensions' arrow buttons (at bottom) and click the left mouse button. The dimension columns will scroll to the left or to the right, depending on the arrow button selected.

VCS Hints: DRS Panel

Access: via Main Menu - 'File' - 'Save DRS'



The DRS Panel is used to save or delete files that are written in the PCMDI Data Retrieval and Storage (DRS) format. There are two modes for saving a DRS file: 'Append' mode, appends DRS output to an existing DRS file; 'Replace' mode, overwrites an existing DRS file with new DRS output.

How to Use the DRS Panel

Changing the DRS Directory:
Type the desired directory in the 'Directory' input text window. Press the 'Return' or 'Enter' key to register the end of typing. The 'Sub_Dir' scroll window and possibly also the 'DRS Files' scroll window will change. (If the directory does not exist, the current directory will reappear.) The directory can also be changed by moving the pointer over a directory name in the 'Sub_Dir' scroll window and clicking the left mouse button.

Selecting a DRS File:
Move the pointer over the desired DRS file name in the 'DRS Files' scroll window and click the left mouse button. The 'Output File' input text window will display the selected DRS file.

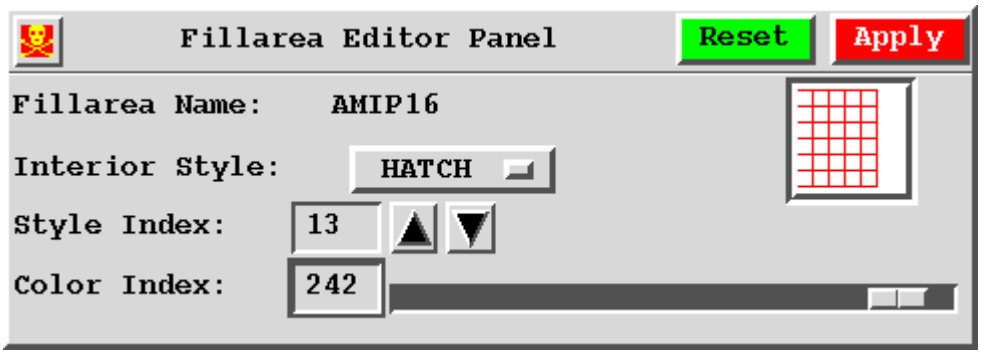
Deleting a DRS File:
Move the pointer over the desired DRS file name in the 'DRS Files' scroll window and click the left mouse button. Then select the yellow 'Delete DRS File' button.

Changing the DRS Output Mode:
Move the pointer over the 'DRS Output Mode:' button, and press and hold the left mouse button. Then move the pointer over 'Append' or 'Replace' and release the left mouse button. The green button in the upper right corner of the DRS Panel will change, showing the toggle selection.

Selecting DRS Data:
Move the pointer over the data name in the 'Data' scroll window and click the left mouse button. The data name will appear in the 'Data' input text window.

VCS Hints: Fillarea Editor Panel

Access: via (Tf) Fillarea Table Panel - Attribute Set Name



The Fillarea Editor Panel allows the user to edit fillarea attributes, including fillarea interior style, style index, and color index. *Note however, the 'default' fillarea attributes cannot be edited.*

How to Use the Fillarea Editor Panel

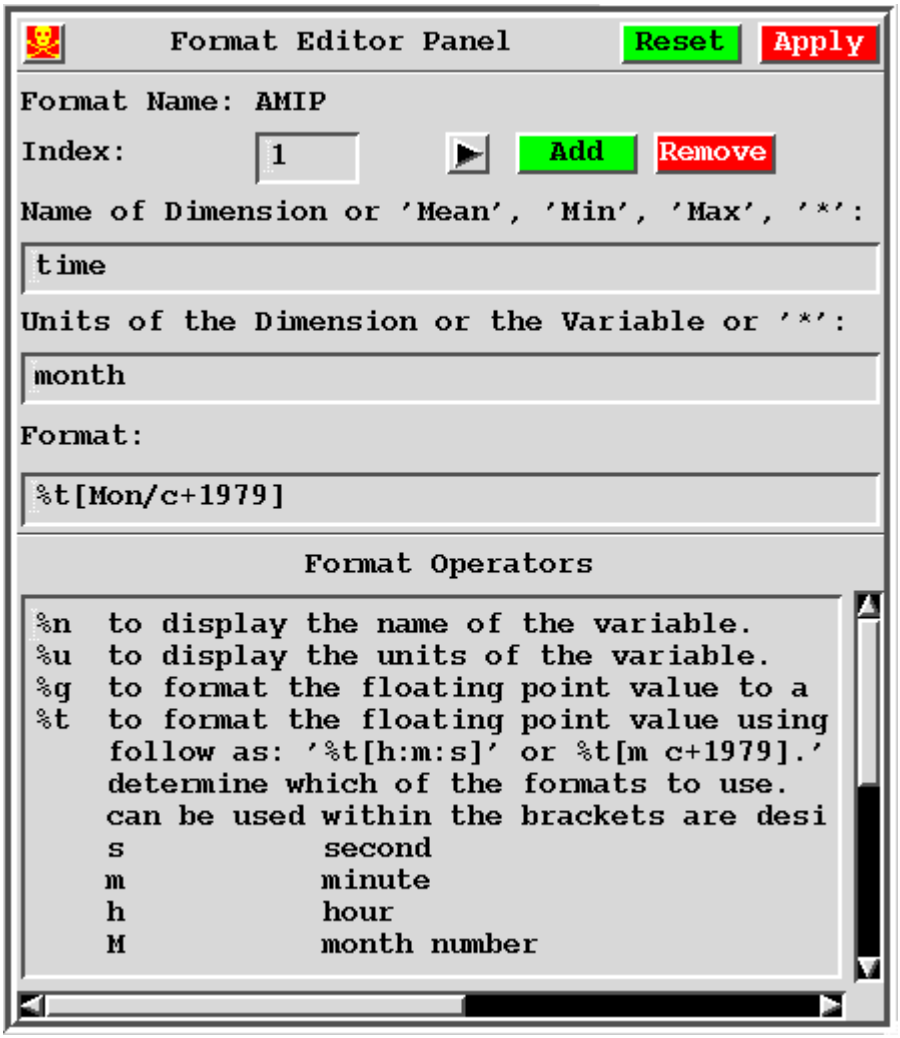
Changing the Fillarea Interior Style:
Move the pointer over the 'Interior Style' menu button and press and hold the left mouse button. Then move the pointer over the desired interior style (i.e., 'SOLID', 'PATTERN', or 'HATCH') and release the left mouse button. The canvas to the right will change accordingly. Select the red 'Apply' button to register changes.

Changing the Fillarea Style Index:
The 'Style Index' is only used when the 'Interior Style' menu button is showing 'PATTERN', or 'HATCH'. Move the pointer over the up or down arrow, and click the left mouse button. The canvas to the right will change to the appropriate style index. Select the red 'Apply' button to register changes.

Changing the Fillarea Color Index:
The 'Color Index' is only used when the 'Interior Style' menu button is showing 'SOLID', or 'HATCH'. Move the pointer over the 'Color Index' slider bar and press and hold the left mouse button. Then move the slider bar to the desired color index. The changes will be shown on the canvas to the right. Select the red 'Apply' button to register changes.

VCS Hints: Format Editor Panel

Access: via (Th) Format Table Panel - Attribute Set Name



The Format Editor Panel allows editing of format attributes of a dimension, including its name, units, and format string. *Note however, the 'default' format attributes cannot be edited.*

How to Use the Format Editor Panel

Indexing the Format:
Move the pointer over the right arrow and click the left mouse button. The 'Index' input text window will increment by 1 and the Format Editor Panel will change accordingly. The 'Index' input text window can also be edited. Select the red 'Apply' button to register changes.

Adding or Removing a Format Attribute:
To add a format attribute, move the pointer over the green 'Add' button and click the left mouse button. To remove a format attribute, move the pointer over the red 'Remove' button and click the left mouse button. In both cases, the Format Editor Panel will change accordingly. Select the red 'Apply' button to register changes.

Editing the Dimension Name:
Move the pointer in the 'Name of Dimension ...' input text window and click the left mouse button. Enter the name of the single-valued dimension of the array data, 'Mean', 'Max', 'Min', or '*'. Select the red 'Apply' button to register changes.
Editing the Dimension Units:

Move the pointer in the 'Units of the Dimension ...' input text window and click the left mouse button. Enter the unit name, variable name, or '*'. Select the red 'Apply' button to register changes.

Editing the Format String:
Move the pointer into the 'Format' input text window and click the left mouse button. Then enter the desired format string. The format operators are listed below in the 'Format Operators' scroll window. Select the red 'Apply' button to register changes.

VCS Hints: Graphics Method Panel

Access: via Main Menu - 'Primary' - 'Graphics Table' - 'Boxfill','Continents', 'Isofill','Isoline', 'Outfill', 'Outline', 'Scatter', 'Vector', 'XvsY', 'Xyvsy', or 'Yxvsx'

Graphics Method Panel
(Showing Boxfill Method as Example)

The Graphics Method Panel lists attribute sets corresponding to each of the available graphics methods which define how data are displayed on the VCS Canvas: 'Boxfill', 'Continents', 'Isofill', 'Isoline', 'Outfill', 'Outline', 'Scatter', 'Vector', 'XvsY','Xyvsy', and 'Yxvsx'. VCS treats the graphics method as one of the three primary elements. *Note: the 'default' attribute sets cannot be removed or edited.*

How to use the Graphics Method Panel

Selecting a Graphics Method Attribute Set:
Move the pointer over the desired attribute set name for the chosen graphics method (selected via the Main Menu - 'Primary' - 'Graphics Table' - 'Boxfill', 'Continents', etc.), and click the left mouse button. An editor panel for the chosen graphics method will appear below (i.e., editors for 'Boxfill', 'Continents', 'Isofill', 'Isoline', 'Outfill', 'Outline', 'Scatter', 'Vector', 'XvsY','Xyvsy', and 'Yxvsx' graphics methods).

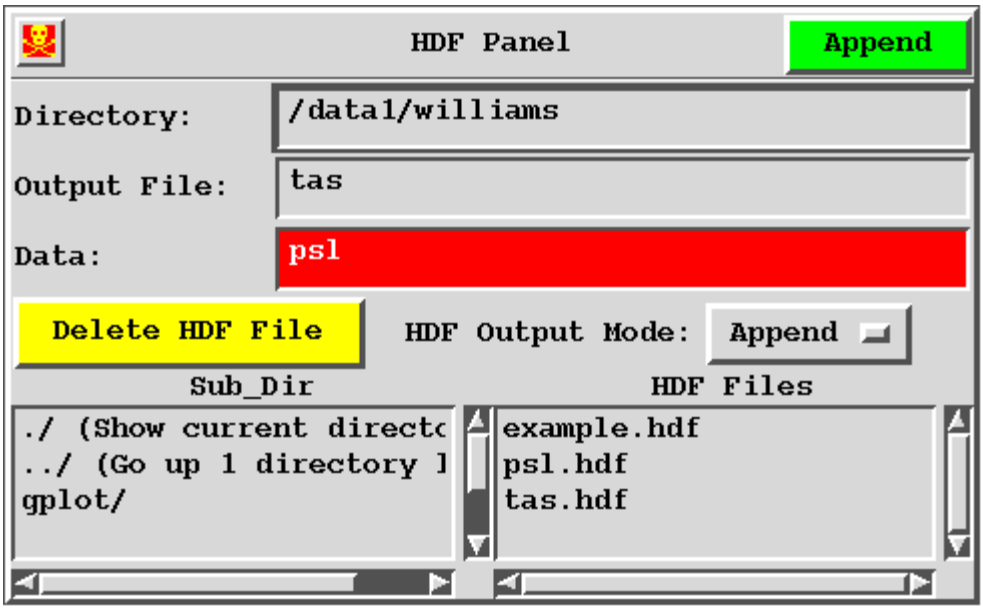
Copying and Dropping a Graphics Method Attribute Set:
To copy, move the pointer over a graphics method attribute set name and click the middle mouse button. To drop, move the pointer to the blue text window on the Page Description Panel (located above the Graphics Method Panel), and click the middle mouse button.

Removing a Graphics Method Attribute Set:
Move the pointer over the graphics method attribute set name to be removed and click the right mouse button.

Using the 'Graphics Method' Menu Button
Selecting the button above the scroll window (whose label is the chosen graphics method) displays a menu that allows the user to 'Copy', 'Rename', 'Script', or 'Remove' a selected attribute set for the chosen graphics method.

VCS Hints: HDF Panel

Access: via Main Menu - 'File' - 'Save HDF'



The HDF Panel is used to save or delete files that are written in the Hierarchical Data Format (HDF) format, developed at the National Center for Supercomputing Applications (NCSA). There are two modes for saving an HDF file: 'Append' mode, appends HDF output to an existing HDF file; 'Replace' mode, overwrites an existing HDF file with new HDF output.

How to Use the HDF Panel

Changing the HDF Directory:
Type the desired directory in the 'Directory' input text window, and press the 'Return' or 'Enter' key to register the end of typing. The 'Sub_Dir' scroll window and possibly also the 'HDF Files' scroll window will change. (If the directory does not exist, the current directory will reappear.) The directory can also be changed by moving the pointer over a directory name in the 'Sub_Dir' scroll window and clicking the left mouse button.

Selecting an HDF File:
Move the pointer over the desired HDF file name in the 'HDF Files' scroll window and click the left mouse button. The 'Output File' input text window will display the selected HDF file.

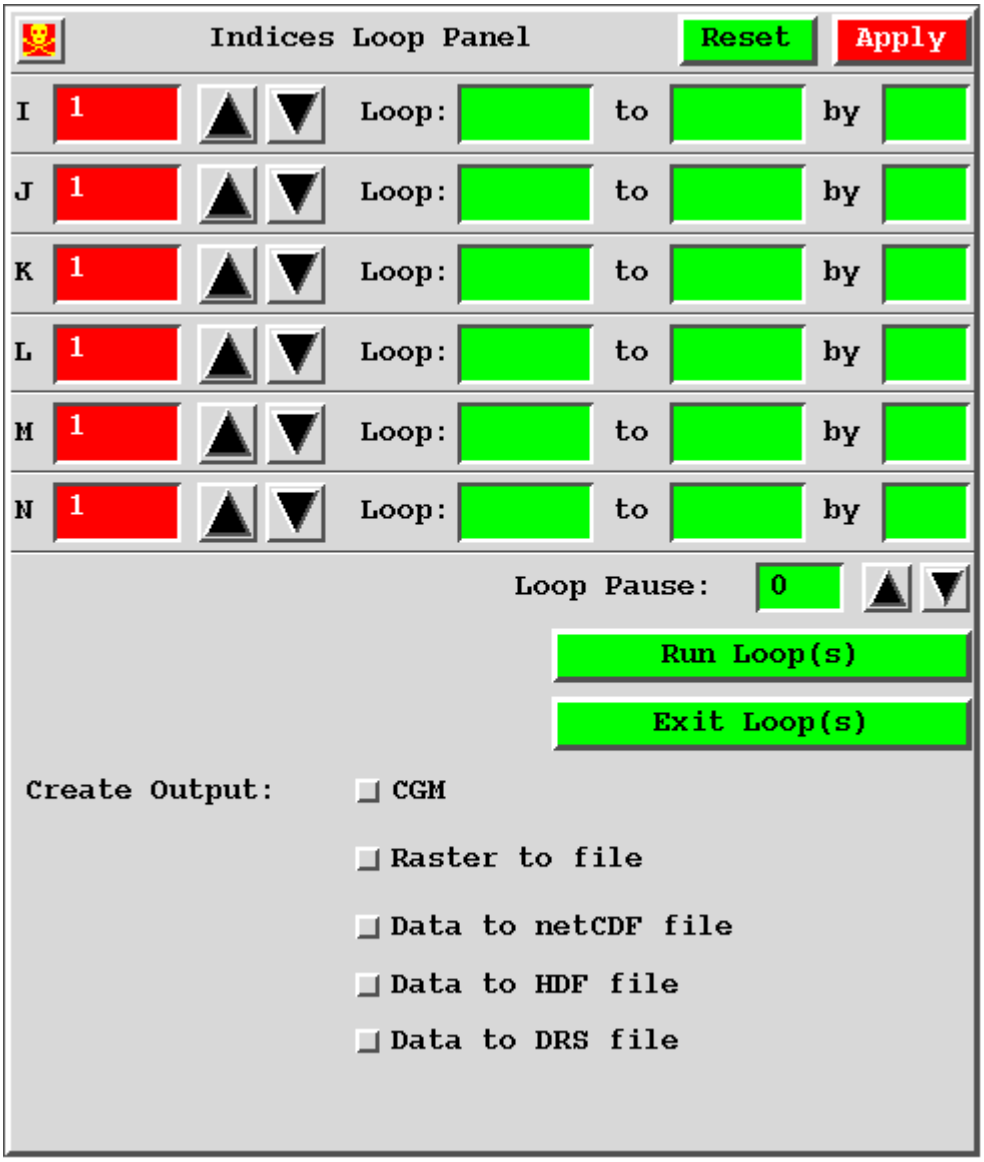
Deleting an HDF File:
Move the pointer over the desired HDF file name in the 'HDF Files' scroll window and click the left mouse button. Then select the yellow 'Delete HDF File' button.

Changing the HDF Output Mode:
Move the pointer over the 'HDF Output Mode:' button, and press and hold the left mouse button. Then move the pointer over 'Append' or 'Replace' and release the left mouse button. The green button in the upper right corner of the HDF Panel will change, showing the toggle selection.

Selecting HDF Data:
Move the pointer over the data name in the 'Data' scroll window and click the left mouse button. The data name will appear in the 'Data' input text window.

VCS Hints: Indices Loop Panel

Access: via Main Menu - 'File' - 'Multi-Save (Indices)'



The Indices Loop Panel is used to loop through global indices (I, J, K, L, M, and N). It is also used to save multiple sets of cgm output, raster output, netCDF output, HDF output, or DRS output in a single file.

How to Use the Indices Loop Panel

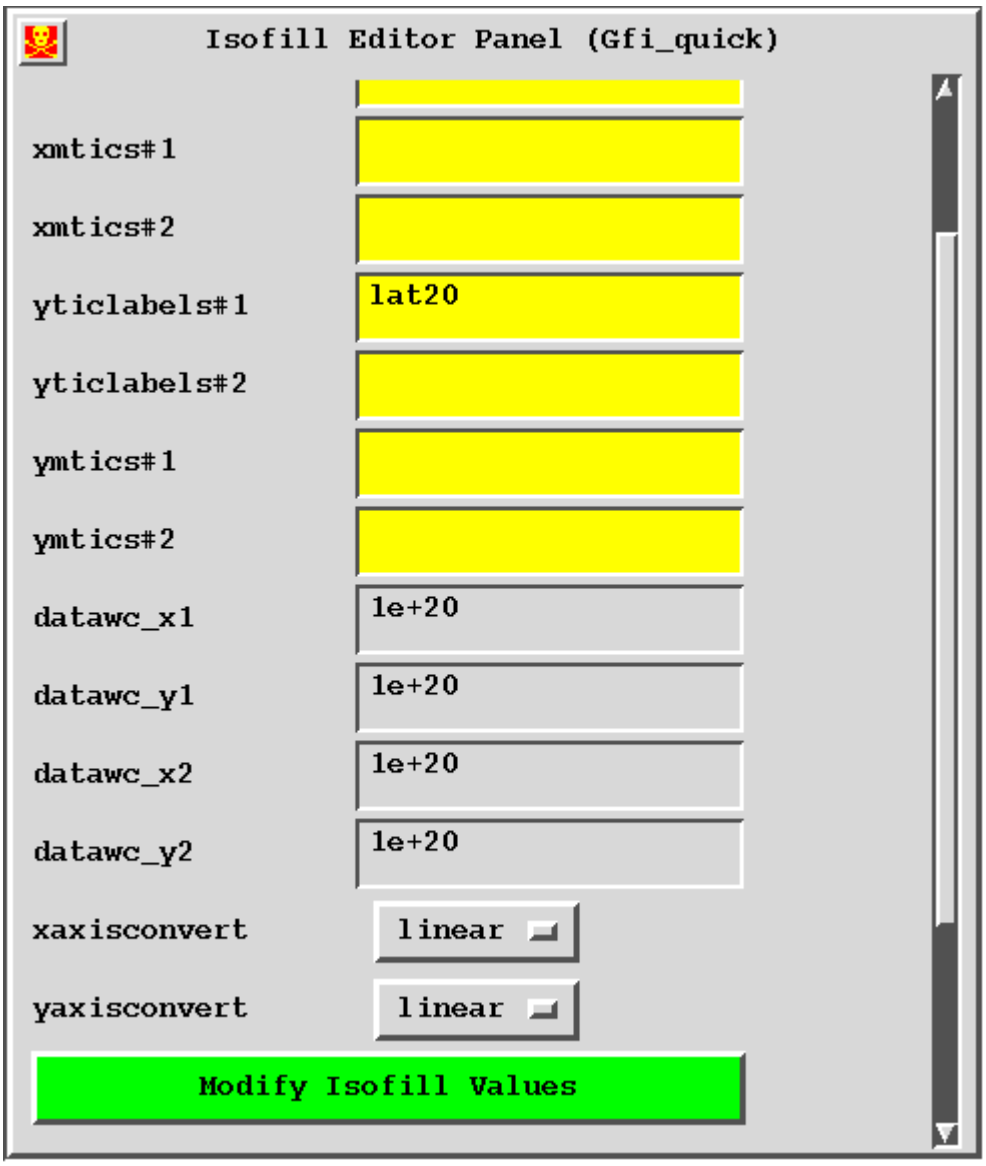
Incrementing or Decrementing an Index:
Values of the global indices (I, J, K, L, M, and N) are displayed in rows at the left side of the Indices Loop Panel along with corresponding up-arrows and down-arrows. To increment an index value, move the pointer over the corresponding up-arrow, and click the left mouse button. To decrement an index value, move the pointer over the corresponding down-arrow, and click the left mouse button. When finished incrementing or decrementing, select the red 'Apply' button to view changes.

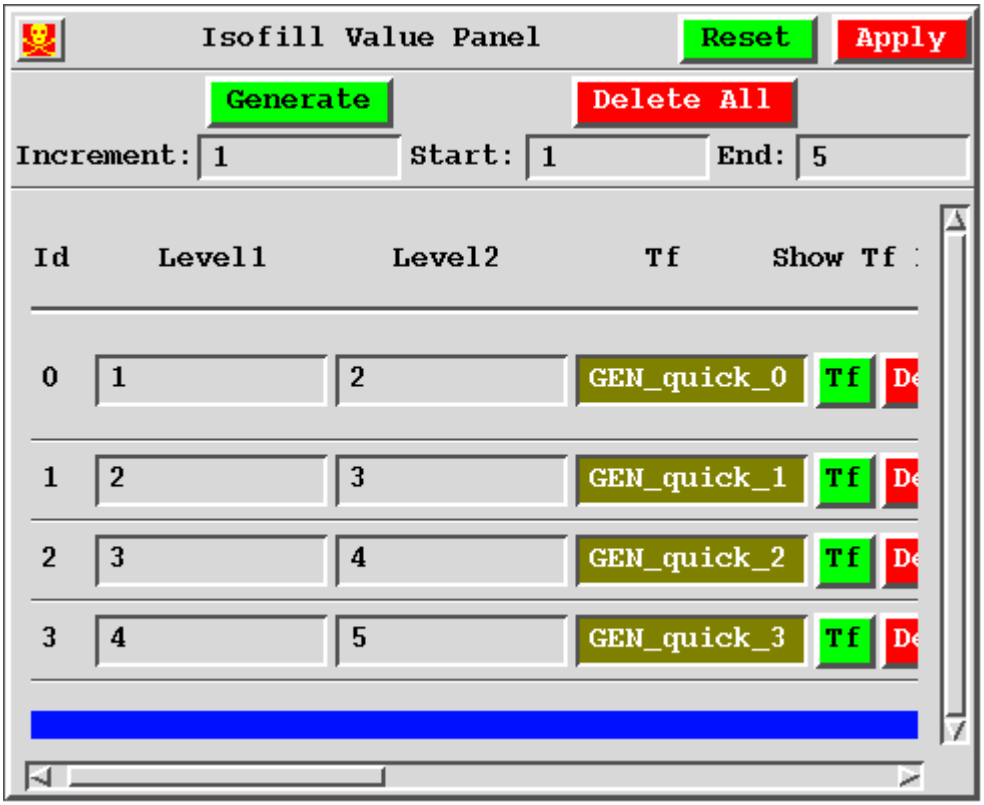
Looping on Indices:
Looping on an index is implemented by specifying loop end points 'from' and 'to' with a 'by' step increment (e.g., 'I' Loop from 1 to 10 by 1) in the green input text windows. The 'Loop' input text window receives the 'from' value, the 'to' window the 'to' value, and the 'by' window the step value. After the loop indices are set up, select the green 'Run Loop(s)' button to begin looping through the indices. Select the green 'Exit Loop(s)' button to stop looping. Select the 'Loop Pause' up-arrow or down-arrow to speed up or slow down viewing of the plots.

Creating Output Files:
While looping on an index, a cgm, raster, netCDF, HDF, or DRS file can also be created. Select the 'CGM' toggle button to save cgm output, the 'Raster to file' toggle button to save raster output, the 'Data to netCDF file' to save netCDF output, the 'Data to HDF file' to save HDF output, and the 'Data to DRS file' to save DRS output. The CGM Panel, Raster Panel, netCDF Panel, HDF Panel, or DRS Panel will appear when the respective toggle buttons are selected. To cancel output, reselect the toggle button(s).

VCS Hints: Isofill Editor and Isofill Value Panels

Access: via Isofill Graphics Method Panel - Attribute Set Name


Isofill Editor Panel (Gfi_quick)
xmtics#1
xmtics#2
yticlabels#1
lat20
yticlabels#2
ymtics#1
ymtics#2
datawc_x1
1e+20
datawc_y1
1e+20
datawc_x2
1e+20
datawc_y2
1e+20
xaxisconvert
linear
yaxisconvert
linear
Modify Isofill Values



The Isofill Editor Panel displays and modifies the isofill graphics method attribute set names. The Isofill Value Panel displays and modifies isolevel values. The isofill graphics method fills the area between selected isolevels (levels of constant value) of a two-dimensional array.

How to Use the Isofill Editor Panel

Changing the Map Projection:
Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button to register changes.

Setting a List Name for Labels and Tick Marks:
Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks; 'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new attribute set name into the yellow input text window.

Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

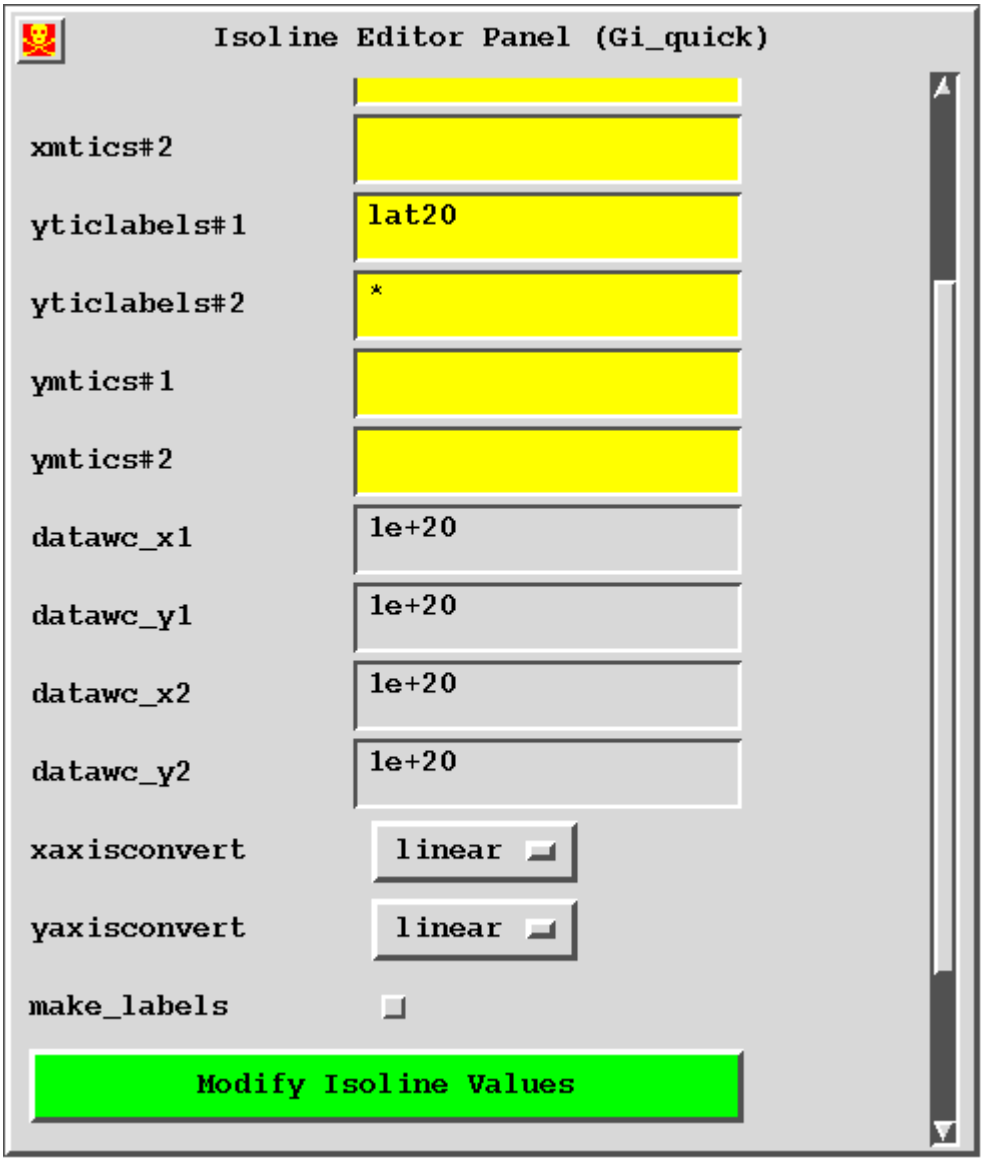
Converting the X-, Y-axis:
The x- and y-axis for the isofill graphics method can be changed from linear (the default setting) to: log base 10 (log10), natural log (ln), exponential (exp), or area weighted (area_wt). Move the pointer over the 'xaxisconvert' or 'yaxisconvert' menu button and press and hold the left mouse button. Then move the pointer over the desired axis transformation and release the left mouse button. Select the red 'Apply' button to register changes.

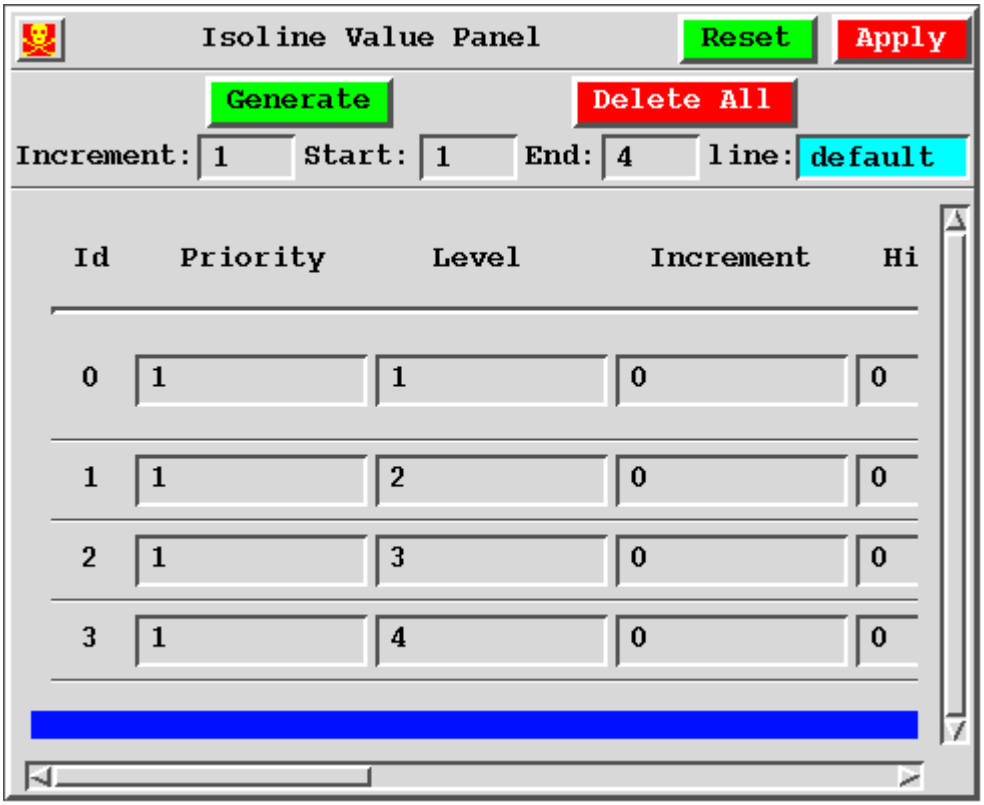
Setting Isolevel Ranges:
To set isolevel ranges, select the green 'Modify Isofill Values' button--an Isofill Values Panel will appear in front of the Isofill Editor Panel. To generate isolevels, enter the 'Increment' number, the 'Start' number, and the 'End' number in the appropriate input text windows, then select the green 'Generate' button. The generated isolevels will appear below showing the ID, the level 1 and level 2, a created fillarea attribute 'Tf' olive green input text window, a green 'show fillarea attribute Tf' button, and a red 'delete isolevel' button.

The 'Tf' input text window indicates the fillarea secondary element that is in use. (See associated Hints for copy and drop procedures.) If the green 'show fillarea attribute Tf' button is selected, then the 'Fillarea Editor Panel' appears. If a value of '1e+20' appears in the 'level 1' and 'level 2' input text windows, then VCS generates default isolevels. To delete all the generated isolevels, select the red 'Delete All' button. Select the red 'Apply' button to register changes.

VCS Hints: Isoline Editor and Isoline Value Panels

Access: via Isoline Graphics Method Panel - Attribute Set Name





The Isoline Editor Panel displays the isoline graphics method attribute set names and assignment values. The isoline graphics method draws isolines (lines of constant value) at specified levels to graphically represent a two-dimensional array, and it also labels the values of these isolines.

How to Use the Isoline Editor Panel

Changing the Map Projection:
Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button to register changes.

Setting a List Name for Labels and Tick Marks:
Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks; 'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new attribute set name into the yellow input text window.

Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

Converting the X-, Y-axis:
The x- and y-axis for the isoline graphics method can be changed from linear (the default setting) to: log base 10 (log10), natural log (ln), exponential (exp), or area weighted (area_wt). Move the pointer over the 'xaxisconvert' or 'yaxisconvert' menu button and press and hold the left mouse button. Then move the pointer over the desired axis

transformation and release the left mouse button. Select the red 'Apply' button to register changes.

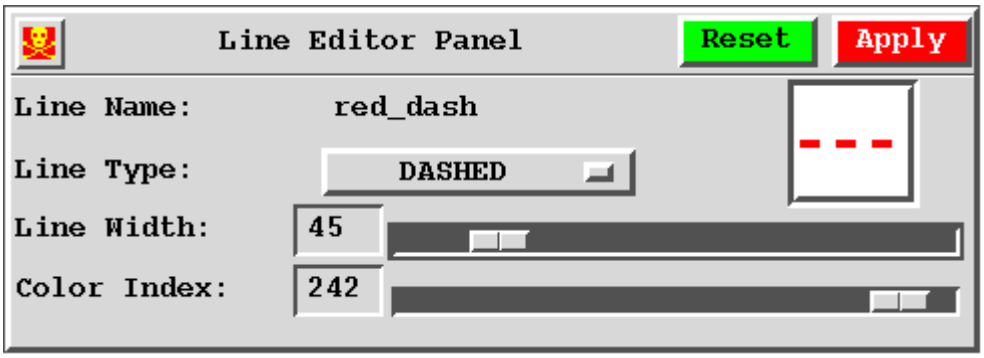
Displaying Isoline Labels:
To display isoline labels, move the pointer over the 'make_labels' toggle button and select with the left mouse button. To remove isoline labels, move the pointer over the depressed 'make_labels' toggle button and select with the left mouse button. Select the red 'Apply' button at the top of the Isoline Editor Panel to register changes.

Setting Isoline Values:
To set isoline values, select the green 'Modify Isoline Values' button--an Isoline Value Panel then will appear in front of the Isoline Editor Panel. To generate isolines, enter the 'Increment' number, the 'Start' number, and the 'End' number in the appropriate input text windows. The line attribute name can also be entered in the 'line' cyan input text window. The generated isolines will appear below showing the ID, the priority, the level, the increment value, the hilite, the label, the line attribute 'Tl' in the cyan input text window, a green 'show line attribute Tl' button, the text attribute 'Tt' in the magenta input text window, the text orientation attribute 'To' in the orange input text window, a green 'show text and text orientation attribute Tt' button, and a red 'delete isoline' button.

The 'Tl' input text window indicates the secondary element 'line' that is in use. The 'Tt' input text window indicates the secondary element 'text' that is in use. The 'To' input text window indicates the secondary element 'text orientation' that is in use. (See associated Hints for copy and drop procedures.) If the green 'show line attribute Tl' button is selected, then the Line Editor Panel will appear. If the green 'show text and text orientation attribute Tt' button is selected, then the Text Editor Panel will appear. If a value of '1e+20' appears in the 'Increment' input text window, then VCS generates default isolines. To delete all the generate isolines, select the red 'Delete All' button. Select the red 'Apply' button to register changes.

VCS Hints: Line Editor Panel

Access: via (Tl) Line Table Panel - Attribute Set Name



The Line Editor Panel allows the editing of line type, width, and color index.

How to Use the Line Editor Panel

Changing the Line Type:
Position the pointer over the 'Line Type' menu button and press and hold the left mouse button--a list of five line types will appear. Then move the pointer over the desired line type and release the left mouse button-- the change will appear on the canvas to the right. Select the red 'Apply' button to register the change.

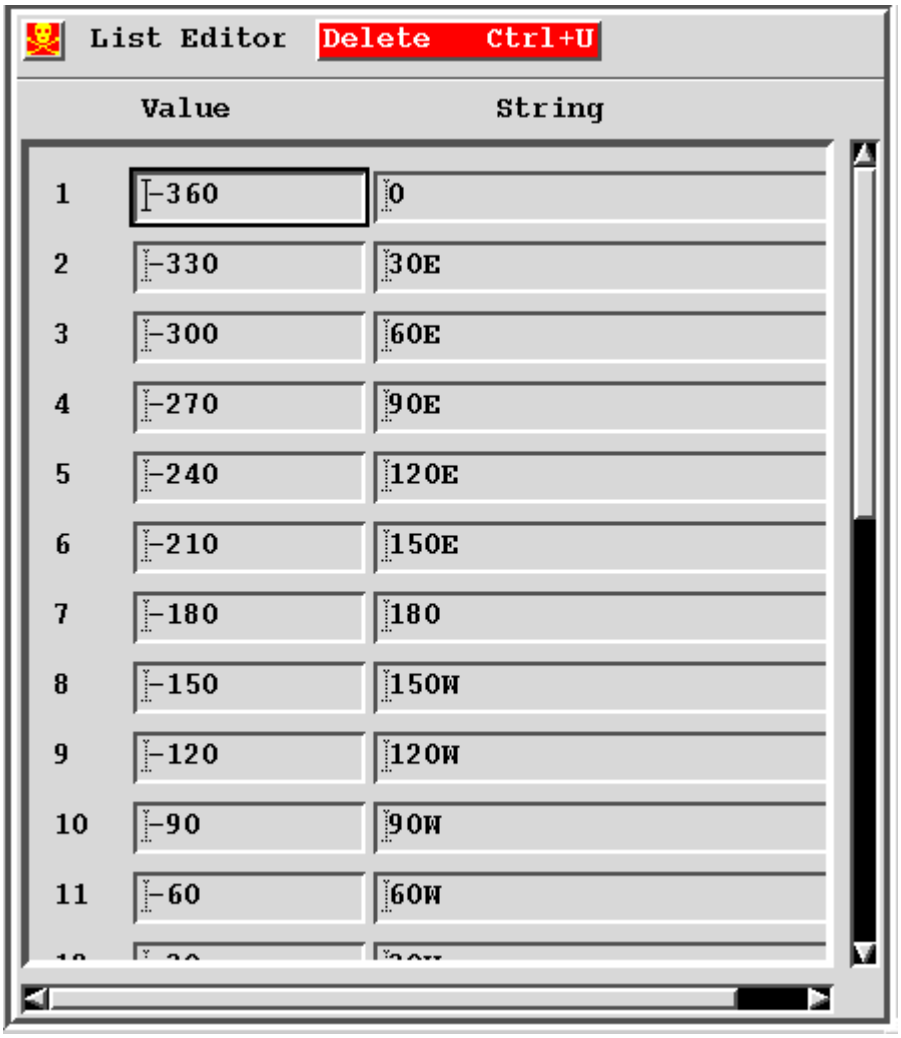
Changing the Line Width:
Position the pointer over the 'Line Width' slider bar and, while holding the left mouse button, move the slider bar. The 'Line Width' input text window will change, and the canvas below will show the change in line width. Select the red 'Apply' button to register the change.

Changing the Color Index:
Position the pointer over the 'Color Index' slide bar button and, while holding the left mouse button, move the slide bar button. The 'Color Index' input text window will change, and the

canvas below will show the change in color index. Select the red ‘Apply’ button to register the change.

VCS Hints: List Editor Panel

Access: via List Table Panel - Attribute Set Name



The List Editor Panel allows editing of the list attributes that define tick mark positions and dimension labels and positions. (A list consists of sequential pairs of [value, string] combinations, which can be referred to in their entirety or as a single indexed pair.) *Note however, the ‘lon30’ and ‘lat20’ lists cannot be edited.*

How to Use the List Editor Panel

Deleting a Line:
Move the pointer to the line to be deleted, and click the left mouse button in the ‘Value’ or ‘String’ input text window. From the keyboard, press the ‘Ctrl’ key and the ‘U’ key simultaneously. As an alternative, the red ‘Delete ...’ button can be selected with the left mouse button. Select the red ‘Apply’ button to register changes.

Editing a List:
Move the pointer to the desired input text window and click the left mouse button. Select the red ‘Apply’ button to register changes.

Creating a New Line:
If the input text cursor is at the beginning of the 'Value' text and the 'Return' or 'Enter' key is pressed, a new line will be added above the current list line. If the input text cursor is at the end of the 'String' text and the 'Return' or 'Enter' key is pressed, a new line will be added below the current list line. Select the red 'Apply' button to register changes.

Using the Arrow Keys:
The left-arrow key moves the input text cursor one space to the left, and the right-arrow key moves the input text cursor one space to the right. The up-arrow key moves the input text cursor up one list line, and the down-arrow key moves the input text cursor down one list line.

VCS Hints: List Table Panel

Access: via Main Menu - 'Basic' - 'List Table'

The List Table Panel contains list attribute set names that define sequential pairs of values and corresponding strings (e.g., longitude values and labels). VCS treats the list attribute as one of the eight secondary elements that are used in describing the three primary elements (template, graphics method, data). *Note: the 'lon30' or 'lat20' lists cannot be removed or edited.*

How to Use the List Table Panel

Selecting a List:
Move the pointer over the desired list attribute set name and click the left mouse button. The List Editor Panel will appear below.

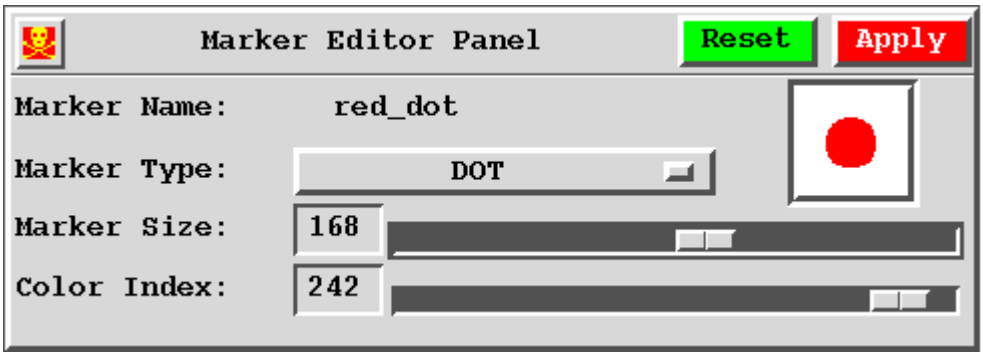
Copying and Dropping a List:
To copy a list, move the pointer over the desired list attribute set name and click the middle mouse button. To drop, move the pointer to a text window slot that has the same yellow color as the List Table, and click the middle mouse button.

Removing a List:
Move the pointer over the list attribute set name to be removed and click the right mouse button.

Using the 'Lists' Menu Button:
Selecting the 'Lists' button displays a menu that allows the user to 'Copy', 'Rename', 'Script', or 'Remove' a selected list attribute set.

VCS Hints: Marker Editor Panel

Access: via (Tm) Marker Table Panel - Attribute Set Name



The Marker Editor Panel allows the editing of the marker type, width, and color index.

How to Use the Marker Editor Panel

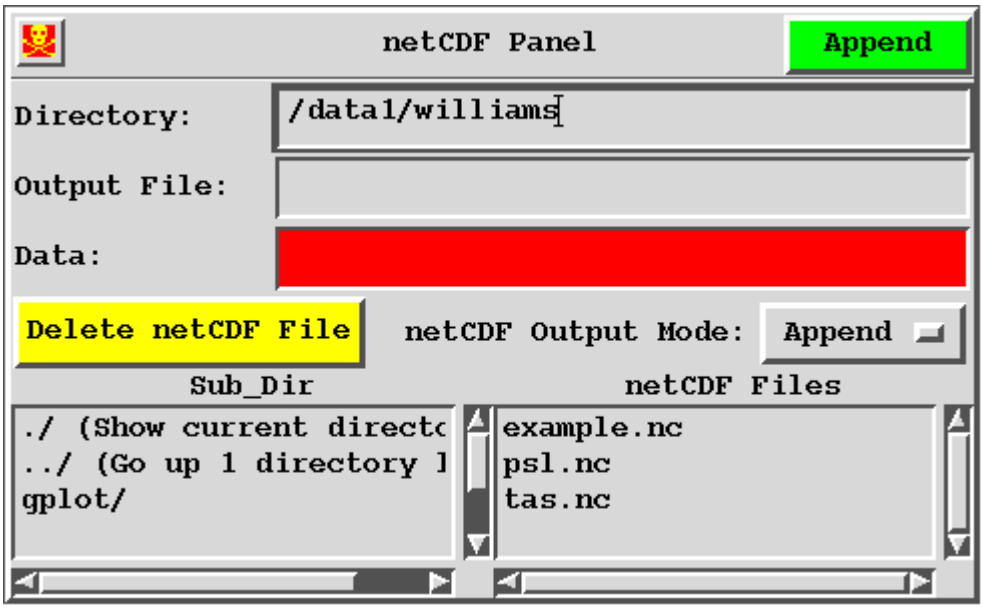
Changing the Marker Type:
Position the pointer over the 'Marker Type' menu button and press and hold the left mouse button--a list of 18 marker types will appear. Then move the pointer over the desired marker type and release the left mouse button--the change will appear on the canvas to the right. Select the red 'Apply' button to register changes.

Changing the Marker Width:
Position the pointer over the 'Marker Width' slidee bar and, while holding down the left mouse button, move the slider bar. The 'Marker Width' input text window will change, and the canvas below will show the change. Select the red 'Apply' button to register the change.

Changing the Color Index:
Position the pointer over the 'Color Index' slider bar. While holding down the left mouse button, move the slider bar. The 'Color Index' input text window will change, and the canvas below will show the change. Press the red 'Apply' button to register the change.

VCS Hints: netCDF Panel

Access: via Main Menu - 'File' - 'Save netCDF'



The netCDF Panel is used to save or delete files that are written in the Network Common Data Form (netCDF) format, developed by the Unidata Program of the National Science Foundation (NSF) Division of the Atmospheric Sciences. There are two modes for saving a netCDF file: 'Append' mode, appends netCDF output to an existing netCDF file; 'Replace' mode, overwrites an existing netCDF file with new netCDF output.

How to Use the netCDF Panel

Changing the netCDF Directory:
Type the desired directory in the 'Directory' input text window, and press the 'Return' or 'Enter' key to register the end of typing. The 'Sub_Dir' scroll window and possibly also the 'netCDF Files' scroll window will change. (If the directory does not exist, the current directory will reappear.) The directory can also be changed by moving the pointer over a directory name in the 'Sub_Dir' scroll window and clicking the left mouse button.

Selecting a netCDF File:
Move the pointer over the desired netCDF file name in the 'netCDF Files' scroll window and click the left mouse button. The 'Output File' input text window will display the selected netCDF file.

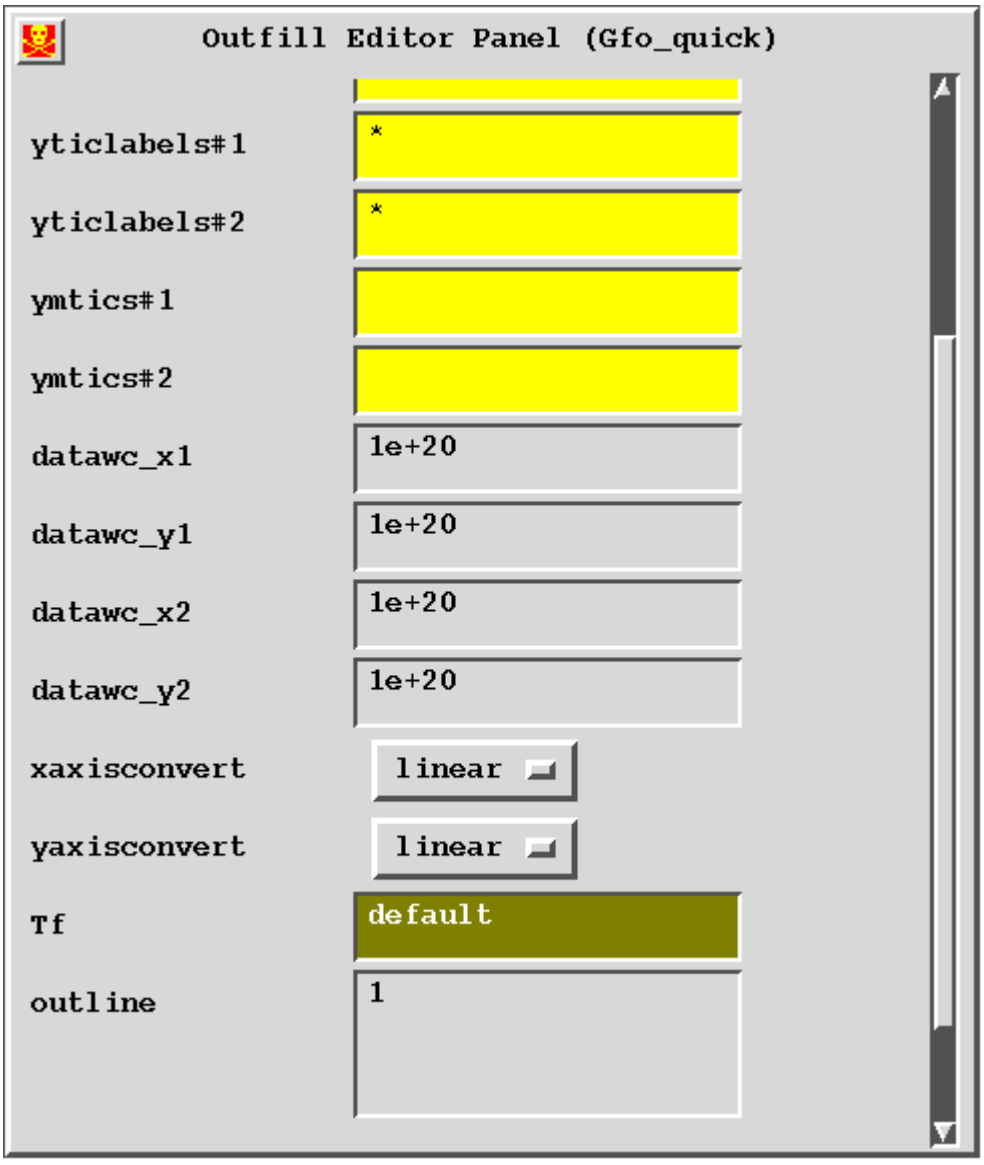
Deleting a netCDF File:
Move the pointer over the desired netCDF file name in the 'netCDF Files' scroll window and click the left mouse button. Then select the yellow 'Delete netCDF File' button.

Changing the netCDF Output Mode:
Move the pointer over the 'netCDF Output Mode:' button, and press and hold the left mouse button. Then move the pointer over 'Append' or 'Replace' and release the left mouse button. The green button in the upper right corner of the netCDF Panel will change, showing the toggle selection.

Selecting netCDF Data:
Move the pointer over the data name in the 'Data' scroll window and click the left mouse button. The data name will appear in the 'Data' input text window.

VCS Hints: Outfill Editor Panel

Access: via Outfill Graphics Method Panel - Attribute Set Name



The Outfill Editor Panel displays the outfill graphics method attribute set names and assignment values. The primary purpose of the outfill graphics method is to display continents by filling their area as defined by a surface type array that indicates land, ocean, and sea-ice points. More generally, the outfill graphics method fills a set of integer values in any data array.

How to Use the Outfill Editor Panel

Changing the Map Projection:
Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button to register changes.

Setting a List Name for Labels and Tick Marks:
Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks; 'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new attribute set name into the yellow input text window.

Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

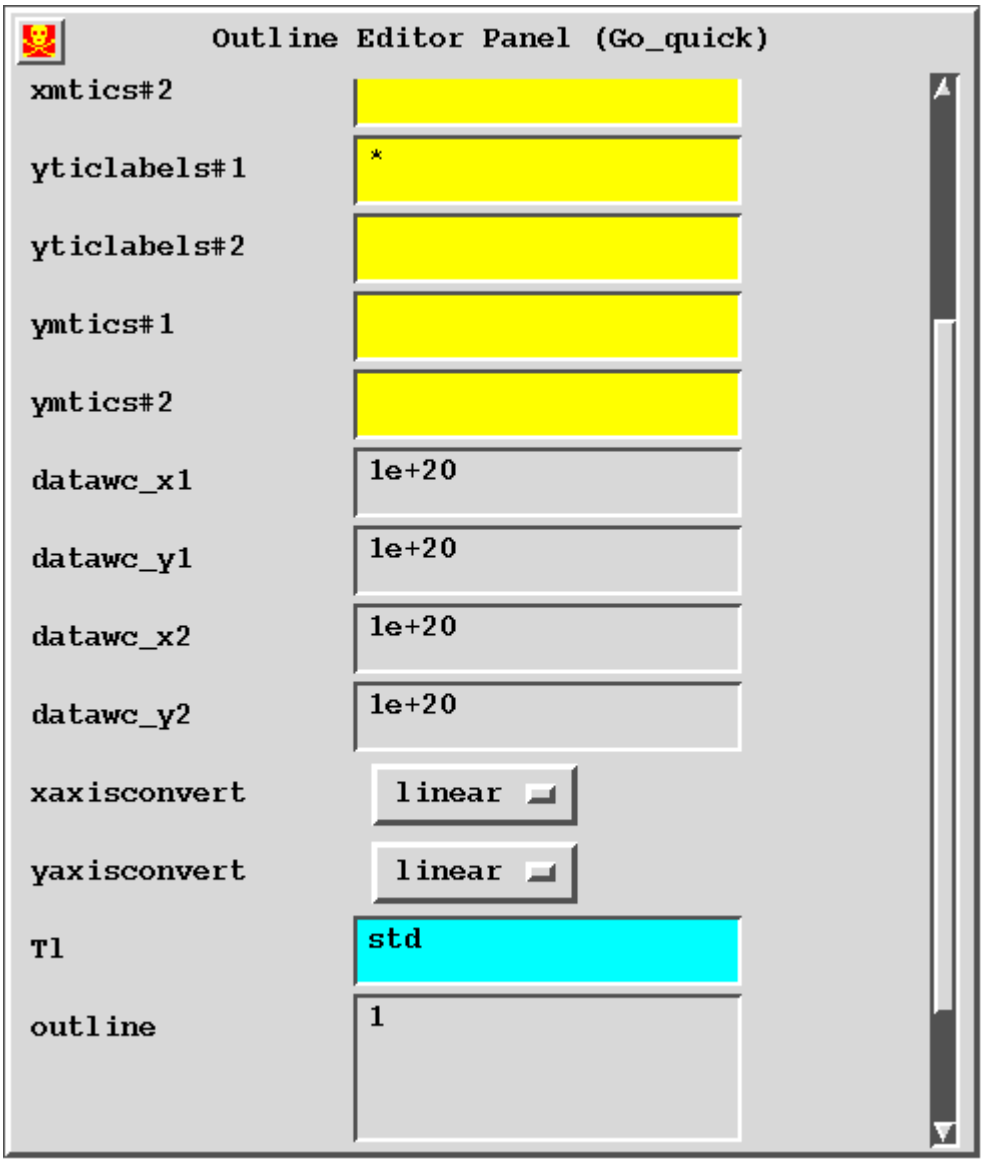
Converting the X-, Y-axis:
The x- and y-axis for the outfill graphics method can be changed from linear (the default setting) to: log base 10 (log10), natural log (ln), exponential (exp), or area weighted (area_wt). Move the pointer over the 'xaxisconvert' or 'yaxisconvert' menu button and press and hold the left mouse button. Then move the pointer over the desired axis transformation and release the left mouse button. Select the red 'Apply' button to register changes.

Changing the Fillarea Type:
To change the fillarea type of the outfill, access the (Tf) Fillarea Table Panel (via Main Menu - 'Basic' - 'Fillarea Table (Tf)'). To copy a fillarea type, move the pointer to the desired fillarea attribute set name and click the *middle* mouse button. To drop, move the pointer to the dark green 'Tf' input text window on the Outfill Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

Setting the Outline Values:
Move the pointer into the 'outline' input text window and click the left mouse button. Type in the desired values separated by commas ','. As few as one, or as many as ten values can be given.

VCS Hints: Outline Editor Panel

Access: via Outline Graphics Method Panel - Attribute Set Name



The Outline Editor Panel displays the outline graphics method attribute set names and assignment values. The primary purpose of the outline graphics method is to display an outline of continents using an array of surface types that indicates land, ocean, and sea-ice points. More generally, the outline graphics method is used to outline a set of values for any integer array.

How to Use the Outline Editor Panel

Changing the Map Projection:
Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button to register changes.

Setting a List Name for Labels and Tick Marks:
Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks; 'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new attribute set name into the yellow input text window.

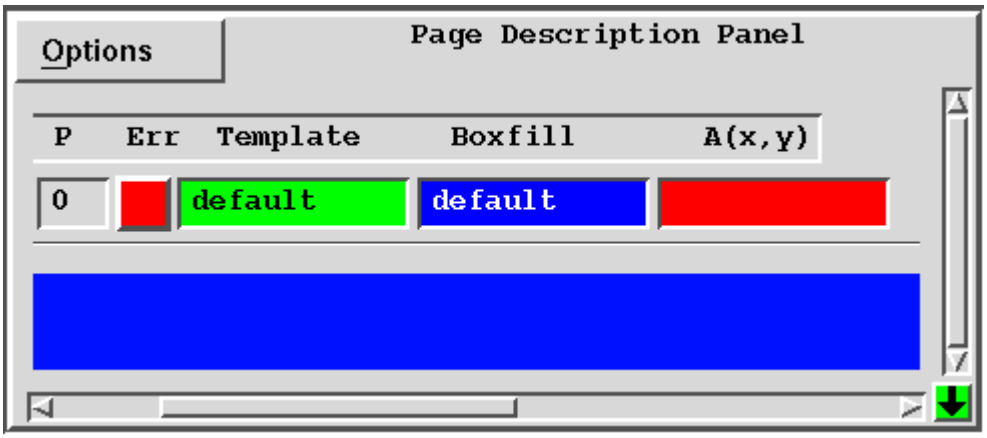
Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

Converting the X-, Y-axis:
The x- and y-axis for the outline graphics method can be changed from linear (the default setting) to: log base 10 (log10), natural log (ln), exponential (exp), or area weighted (area_wt). Move the pointer over the 'xaxisconvert' or 'yaxisconvert' menu button and press and hold the left mouse button. Then move the pointer over the desired axis transformation and release the left mouse button. Select the red 'Apply' button to register changes.

Changing the Line Type:
To change the line type of the outline, access the (Tl) Line Table Panel (via Main Menu - 'Basic' - 'Line Table (Tl)'). To copy a line type, move the pointer to the desired line attribute set name and click the *middle* mouse button. To drop, move the pointer to the cyan 'Tl' input text window on the Outline Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

Setting the Outline Values:
Move the pointer into the 'outline' input text window and click the left mouse button. Type in the desired values separated by commas ','. As few as one, or as many as ten values can be given.

VCS Hints: Page Description Panel



The Page Description Panel is used to specify picture descriptor forms that define how plots are displayed on the VCS Canvas (drawing area). There are three primary elements in each picture descriptor form that correspond to text windows of the template (in green), the graphics method (in blue), and the data (in red). Names are assigned to these text windows from the scroll windows below the Page Description Panel. These scroll windows include a green 'Template' window, a blue 'Graphics Method' window, and a red 'Data' window. (See Hints on the the Template Panel, the Graphics Method Panel, and the Data Panel for details.) Once template, graphics method, and data have been assigned to the picture descriptor form, the plot is drawn on the VCS Canvas.

How to Use the Page Description Panel

Drawing Continents:
There are six predefined continental outlines to choose from: 'None', displays no continents; 'Fine', displays highly detailed coastlines and smaller islands; 'Coarse', displays approximate continents and excludes smaller islands; 'United States', includes 'Fine' continents and 50 continental state boundaries; 'Political Borders', includes 'Fine' continents and sovereign political borders; and 'Rivers', includes 'Fine' continents and major rivers.

The user can include additional continental outlines in VCS through input files **'other7'**, **'other8'**, ..., **'other12'**. The 'Fine', and 'Coarse' continental outlines are internal to VCS, while all other continental outlines are external, and should be located in the **$HOME/PCMDI_GRAPHICS** directory for access by VCS. If VCS cannot find a chosen external continental outline, then it will use 'Fine' as its default. See the Setup Information on Continents Mapping Options for further information.

To select a continental outline, move the pointer over the 'Options' menu button and hold down the left mouse button. Then move the pointer over the 'Continents' menu item while continuing to hold down the left mouse button. Now move the pointer over desired continental outline menu item and release the left mouse button.

Note: if the data to be plotted have 'longitude' as the first dimension and 'latitude' as the second dimension, and if 'None' is not selected as the continental outline type, then continents will automatically be drawn on the plot.

Updating the VCS Canvas:
Updating of the graphical displays on the VCS Canvas can be deferred until a later time. This is helpful when generating templates or displaying numerous plots. The pulldown menu options for updating are 'Automatic': VCS updates the VCS Canvas as necessary; 'Manual': no updating of the VCS Canvas occurs; and 'Now': the VCS Canvas is updated immediately.

To select an update option, move the pointer over the 'Options' menu button and hold down the left mouse button. Then move the pointer over the 'Update' menu item while continuing to hold down the left mouse button, and move the pointer over desired update option.

Creating a Picture Descriptor Form:
To create a new picture descriptor form, move the pointer over the 'Options' menu button and hold down the left mouse button. Then move the pointer over the 'Picture' menu item while continuing to hold down the left mouse button. Next, move the pointer over the 'Create' pull right menu item and release the left mouse button. A new picture descriptor form will appear at the end of the list.

Turning All Plots Off:
To turn off all VCS plots at once, move the pointer over the 'Options' menu button and hold down the left mouse button. Then move the pointer over the 'Picture' menu item while continuing to hold down the left mouse button. Next, move the pointer over 'All Off' pull right menu item and release the left mouse button. All plots on the VCS Canvas will disappear.

Removing a Picture Descriptor Form:
Picture descriptor forms consist of two rows: a label row, including 'Id', 'P', 'On/Off/Err', Template', 'Graphics', 'Data'; and an input row, including text windows and a button. For quick removal of a picture descriptor form, move the pointer over the label row and click the right mouse button. As an alternative, select the label row with the left mouse button. Then move the pointer over the 'Picture' menu button and select the red 'Remove' menu item. All selected picture descriptor forms will be removed.

Removing All Picture Descriptor Forms:
To remove all picture descriptor forms at once, move the pointer over the 'Options' menu button and hold down the left mouse button. Then move the pointer over the 'Picture' menu item while continuing to hold down the left mouse button. Next, move the pointer over the 'Remove' pull right menu item and release the left mouse button. All picture descriptor forms and all plots on the VCS Canvas will be removed.

Copying and Dropping a Template Name:
Move the pointer to the green 'Template' scroll window below the Page Description Panel. To copy a template name, click the *middle* mouse button. To drop, move the pointer to the green 'Template' input text window of the desired page descriptor form, and click the *middle* mouse button. The selected template name will appear in the 'Template' input text window.

Copying and Dropping a Graphics Method Name:
Move the pointer to the blue 'Graphics Method' scroll window below. To copy a graphics method name, click the *middle* mouse button. To drop, move the pointer to the blue 'Graphics' input text window of the desired page descriptor form, and click the *middle* mouse button. The selected graphics method name will appear in the 'Graphics Method' input text window.

Copying and Dropping a Data Name:
Move the pointer to the red 'Data' scroll window below. To copy a data name, click the *middle* mouse button. To drop, move the pointer to the red 'Data' input text window of the desired page descriptor form, and click the *middle* mouse button. The selected data name will appear in the 'Data' input text window.

Monitoring the Status of a Picture Descriptor Form:
The 'Status' button both controls and indicates the status of a picture. Before the picture descriptor form is created, the 'Status' button is red (indicating 'Error' status). When assignments are made (without error) to the 'Template', 'Graphics', and 'Data' input text windows, the button turns green (indicating 'On' status). Once the picture descriptor form is complete, toggling between 'On' (green) and 'Off' (yellow) states switches the display of the plot (in the VCS Canvas) on or off.

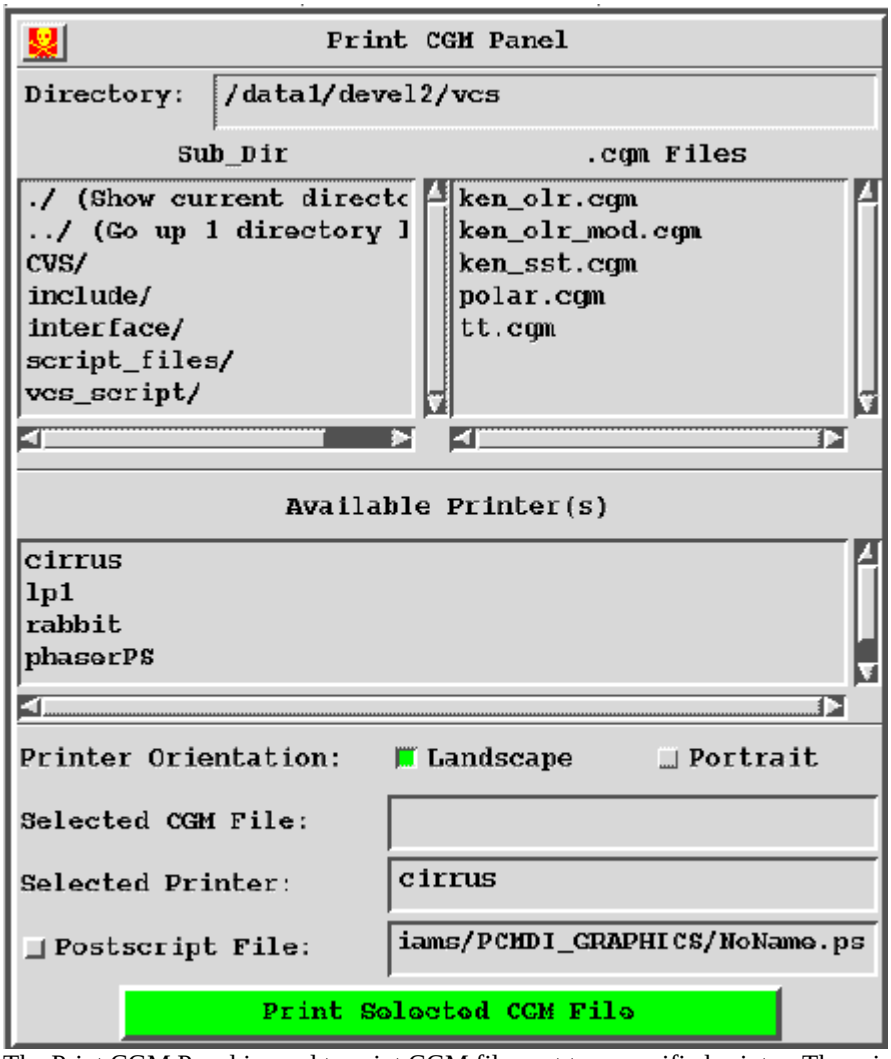
Showing the 'Id' of a Picture Descriptor Form:
Move the bottom horizontal scrollbar to the left. This action will uncover the picture descriptor form 'Id' name.

Setting the Picture Priority:
The picture with the highest priority number is displayed on top of all others. To change a priority, select the 'P' input text window and enter the desired priority number, followed by a 'Return' or 'Enter'.

Enlarging the Page Description Panel:
Move the pointer to the green down-arrow button in the lower right corner of the panel and click the left mouse button. The panel will extend to the bottom of the VCS window. Select the green up-arrow button to restore the panel to its former size.

VCS Hints: Print CGM Panel

Access: via Main Menu - 'File' - 'Print CGM'



The Print CGM Panel is used to print CGM files out to a specified printer. The printer orientation mode is either specified as 'Landscape' (width exceeding height) or 'Portrait' (height exceeding width).

How to Use the Print CGM Panel

Changing the Print CGM Directory:
Type the desired directory in the 'Directory' input text window. Press the 'Return' or 'Enter' key to register the end of typing. The 'Sub_Dir' scroll window and possibly also the '.cgm Files' scroll window will change. (If the directory does not exist, the current directory will reappear.) The directory can also be changed by moving the pointer over a directory name in the 'Sub_Dir' scroll window and clicking the left mouse button.

Selecting a CGM File:
Move the pointer over the desired cgm file name in the '.cgm File' scroll window and click the left mouse button. The 'Selected CGM File:' input text window will display the file name.

Selecting an Output Printer:
Move the pointer over the desired print device name in the 'Available Printer(s)' scroll window and click the left mouse button. The 'Selected Printer:' input text window (below) will display the chosen print device. *Note: a list of available print devices is specified by the HARD_COPY file that is included with installation of VCS.*

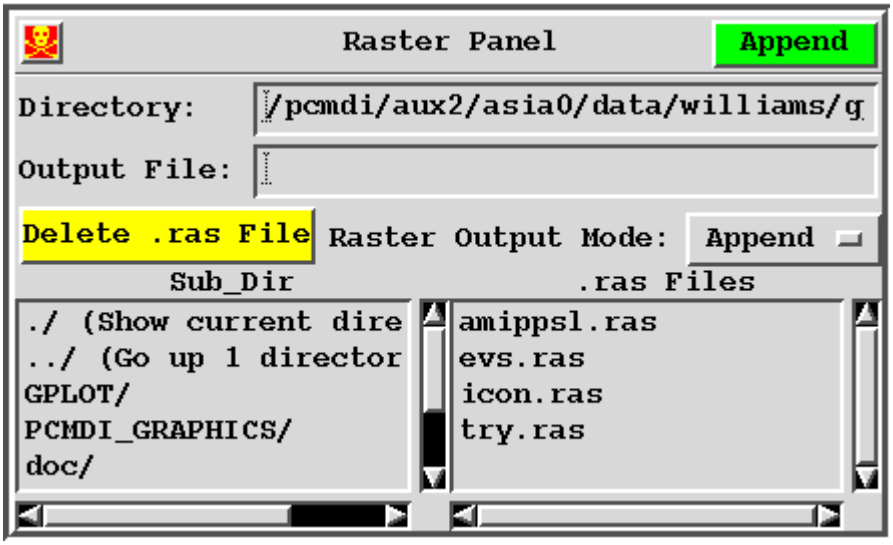
Changing the Print Orientation:
To specify landscape or portrait orientation in printing, select the corresponding 'Printer Orientation:' toggle button on the Print CGM Panel.

Creating a Postscript File:
Move the pointer to the 'Postscript File:' input text window and edit the directory and output postscript filename. The default directory and filename is: '$HOME/PCMDI_GRAPHICS/NoName.ps'. Select the 'Postscript File:' toggle button. When the 'Print Selected CGM File' button is selected, the designated cgm file will be saved as a postscript file.

Sending CGM Files to the Designated Printer or Postscript File:
Select the green 'Print Selected CGM File' button by clicking the left mouse button. This action will send the selected cgm file to the designated printer or postscript file.

VCS Hints: Raster Panel

Access: via Main Menu - 'File' - 'Save Raster'



The Raster Panel is used to save or delete raster files. There are two modes for saving a raster file: 'Append' mode appends raster output to an existing raster file; 'Replace' mode overwrites an existing raster file with new raster output.

How to Use the Raster Panel

Changing the Raster Directory:
Type the desired directory in the 'Directory' input text window. Press the 'Return' or 'Enter' key to register the end of typing. The 'Sub_Dir' scroll window and possibly also the '.ras Files' scroll window will change. (If the directory does not exist, the current directory will reappear.) The directory can also be changed by moving the pointer over a directory name in the 'Sub_Dir' scroll window and clicking the left mouse button.

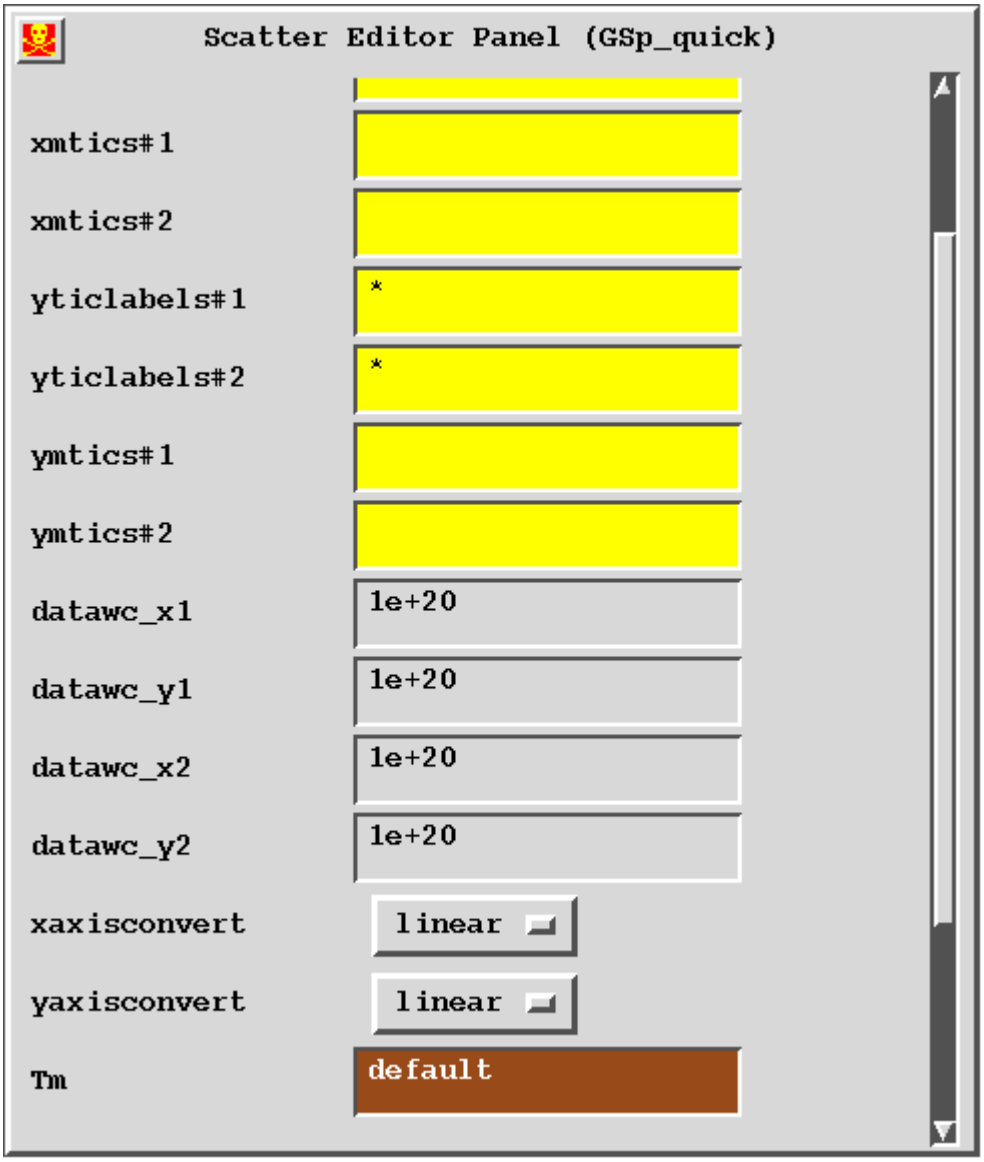
Selecting a Raster File:
Move the pointer over the desired raster file name in the '.ras File' scroll window and click the left mouse button. The 'Output File' input text window will display the selected raster file.

Deleting a Raster File:
Move the pointer over the desired Raster file name in the '.ras File' scroll window and click the left mouse button. Now move the pointer over the red 'Delete .ras File' button, and click the left mouse button.

Changing the Raster Output Mode:
Move the pointer over the 'Raster Output Mode:' button, and press and hold the left mouse button. Move the pointer over 'Append' or 'Replace' and release the left mouse button. The green button in the upper right corner of the Raster Panel will change, showing the toggle selection.

VCS Hints: Scatter Editor Panel

Access: via Scatter Graphics Method Panel - Attribute Set Name



The Scatter Editor Panel displays the attribute set names and assignment values of the scatter graphics method. The scatter graphics method displays a scatter plot of two data arrays, that is A(x, y, z, t) and B(x, y, z, t).

How to Use the Scatter Editor Panel

Changing the Map Projection:
Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button (in upper right corner) to register changes.

Setting a List Name for Labels and Tick Marks:
Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks; 'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new attribute set name into the yellow input text window.

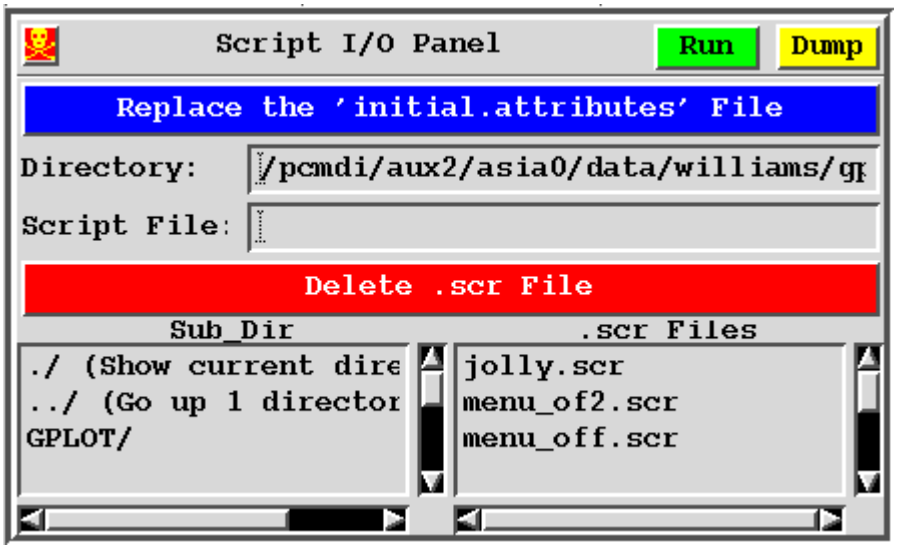
Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

Converting the X-, Y-axis:
The x- and y-axis for the scatter graphics method can be changed from linear (the default setting) to: log base 10 (log10), natural log (ln), exponential (exp), or area weighted (area_wt). Move the pointer over the 'xaxisconvert' or 'yaxisconvert' menu button and press and hold the left mouse button. Then move the pointer over the desired axis transformation and release the left mouse button. Select the red 'Apply' button to register changes.

Changing the Marker Type:
To change the scatter marker type, access the (Tm) Marker Table Panel (via Main Menu - 'Basic' - 'Marker Table (Tm)'). To copy a marker type, move the pointer to the desired marker attribute set name and click the *middle* mouse button. To drop, move the pointer to the brown 'Tm' input text window on the Scatter Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

VCS Hints: Script I/O Panel

Access: via Main Menu - 'File' - 'Script I/O'



The Script I/O Panel is used to save the current state of VCS or to bring a previous state into VCS. It can also be used to replace the 'initial.attributes' file.

How to Use the Script I/O Panel

*Replacing the **'initial.attributes'** File:*
Move the pointer over the blue 'Replace the initial.attributes File' button, then click the left mouse button. The ***'initial.attributes'*** file, located in the 'PCMDI_GRAPHICS' directory, will be updated with the current VCS settings. The previous settings of the ***'initial.attributes'*** file will be saved in file *'initial.attributes%'.*

Changing the Script Directory:
Type the desired directory in the 'Directory' input text window. Press the 'Return' or 'Enter' key to register the end of typing. The 'Sub_Dir' scroll window and possibly the '.scr Files' scroll window will change. (If the specified directory does not exist, the current directory will reappear.) The directory can also be changed by moving the pointer over a directory name in the 'Sub_Dir' scroll window and clicking the left mouse button.

Selecting a Script File:
Move the pointer over the desired script file name in the '.scr File' scroll window and click the left mouse button. The 'Script File' input text window will display the selected script file.

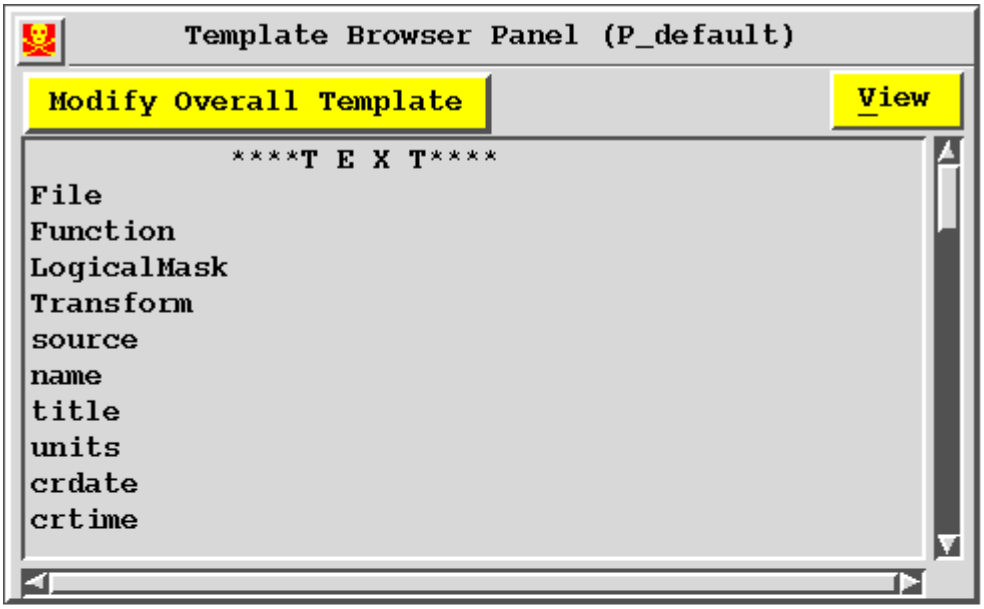
Deleting a Script File:
Move the pointer over the desired script file name in the '.scr File' scroll window and click the left mouse button. Then move the pointer over the red 'Delete Script File' button, and click the left mouse button.

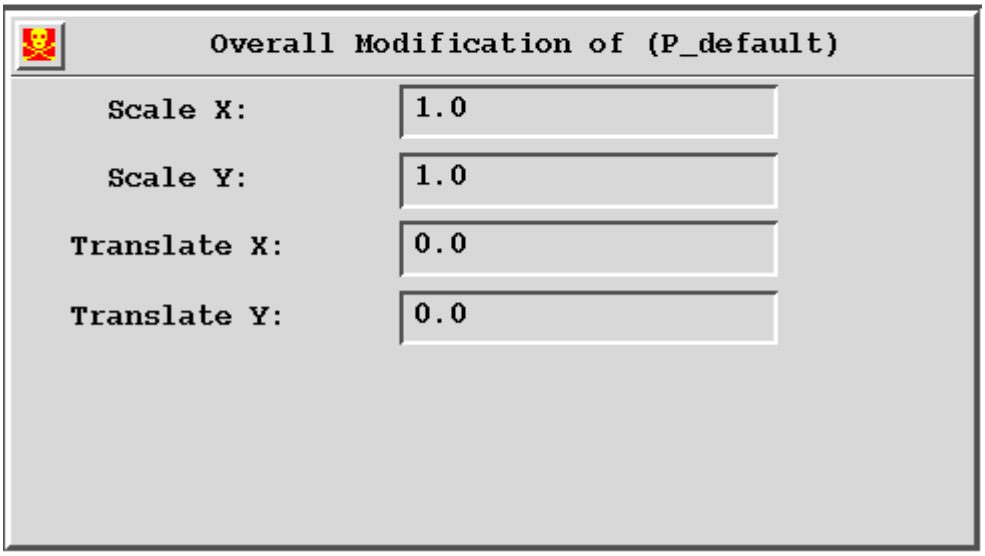
Running a Script File:
Move the pointer over the desired script file name in the '.scr File' scroll window and click the left mouse button. Then move the pointer over the green 'Run' button, and click the left mouse button.

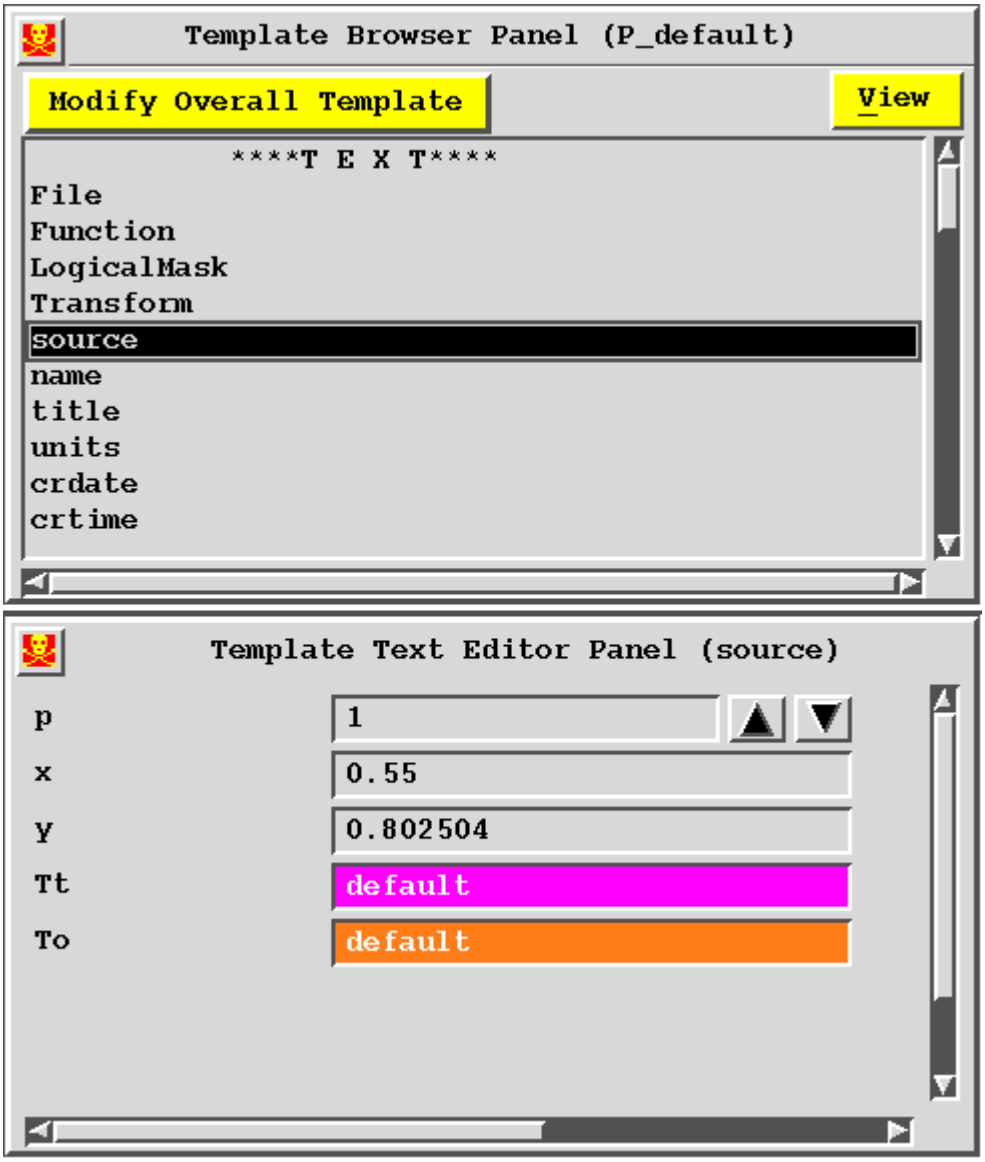
Saving or Dumping a Script File:
Move the pointer over the desired script file name in the '.scr File' scroll window and click the left mouse button, or enter a script name in the 'Script File:' input text window. Then move the pointer over the yellow 'Dump' button, and click the left mouse button.

VCS Hints: Template Browser Panel

Access: via Template Panel - Attribute Set Name







The Template Browser Panel lists subattributes of nine picture template categories: text, format, x-tick marks, y-tick marks, x-labels, y-labels, box/lines, legend space, and display space. These are designated in the Template Browser Panel scroll window by asterisks that precede and follow each category name. The corresponding subattributes also appear in the scroll window below the category name.

How to Use the Template Browser Panel

Displaying the Template Rulers:
To display the temlplate rulers, move the pointer over the yellow 'View' menu button, and press and hold the left mouse button. A menu of options will appear, with the 'tear-off' selection as the first menu element. (The tear-off appears as a dashed line and retains the menu selections on the display.) Then move the pointer over the 'Rulers' menu option and release the left mouse button; rulers will appear above and to the left of the VCS Canvas, which represents the size of a page: 8.5 x 11 inch (21.59 x 27.94 cm) for 'landscape' setting or 11 x 8.5 inch (27.94 x 21.59 cm) for 'portrait' setting.

Displaying the Template Grid:
To display the template grid, move the pointer over the yellow 'View' menu button, and press and hold the left mouse button. Then move the pointer over the 'Grid' menu option and release the left mouse button. Grids lines will appear on the VCS Canvas at intervals of inches or centimeters (see also Specifying the Template Measurement Units).

Specifying the Template Measurement Units (Inches vs Centimeters):
To specify the template measurement units, first move the pointer over the yellow 'View' menu button, and press and hold the left mouse button. Then, to specify measurement units of inches, move the pointer and release the left mouse button on the 'Inch' menu item; to specify measurement units of centimeters, release the left mouse button on the 'Cm' menu item.

Specifying 'Snap to Grid':
To specify 'snap to grid', move the pointer over the yellow 'View' menu button, and press and hold the left mouse button. Then move the pointer over the 'Snap' menu item and release the left mouse button. When the 'Snap' option is on, the user can move graphics objects on the screen by increments of 1/16 inch or 1/10 centimeter. If the 'Snap' option is off, graphics objects can be moved at more precise increments of one pixel length.

Modifying the Overall Template:
All the subattributes can be scaled or translated at once by selecting the yellow 'Modify Overall Template' button. The subpanel labeled 'Overall Modification of (template name)' then will appear below the Template Browser Panel. Scale and/or translate the template by modifying the desired input text window, then select the red 'Apply' button to register changes. When the 'Overall Modification of (template name)' subpanel is brought up, eight red buttons and an interconnecting box also appear on the VCS Canvas. (The box represents the outermost edges of the template and the buttons signify a box corner or edge: 'TL', top left; 'TC', top center; 'TR', top right; 'CR', center right; 'BR', bottom right; 'BC', bottom center; 'BL', bottom left; and 'CL', center left.) By moving the pointer over one of the red buttons and pressing and holding the left mouse button, the box size can be altered, thereby scaling the template: when the left mouse button is released, the template scales to match the new box size. By moving the pointer within the box and pressing and holding the left mouse button, the box can be translated to a different location on the screen: when the left mouse button is released, the template translates to these new coordinates.

Modifying a Subattribute:
Move the pointer over the desired subattribute name and click the left mouse button. A subpanel then appears below the Template Browser Panel to allow editing of the subattribute--select the red 'Apply' button to register changes. When the subpanel is accessed, one, two, or four red boxes also appear on the VCS Canvas representing the subattribute's screen coordinates. To change these coordinates, move the red button to the desired location, and release the left mouse button. The position of the subattribute on the VCS Canvas also can be altered by changing the values of the input text windows labeled 'x', 'y', 'x1', 'y1','x2', or 'y2'. *Note, the position values are either expressed in inches or in centimeters (see Specifying the Template Measurement Units).*

Changing the Priority of a Subattribute:
To change the priority of a subattribute, enter a new integer value in the 'p' input text window in its editing panel. The subattribute with the highest priority number is displayed on top of all others on the VCS Canvas, while a subattribute with priority 0 is not displayed. The priority also can be changed by use of the 'up-down' arrow associated with the subattribute's input text window.

Changing a Secondary Element of a Subattribute:
If a subattribute uses one of the eight secondary elements (e.g., line, marker, text, etc.), then the corresponding input text window is labeled (e.g., 'Tl' for line, 'Tm' for marker, 'Tt' for text, etc.) and colored (e.g., cyan for line, brown for marker, magenta for text, etc.) accordingly. To change a secondary element of a subattribute, copy and drop the desired secondary element attribute name in the input text window of the appropriate secondary element panel. (See Hints associated with the secondary element panels for copy and drop procedures.)

VCS Hints: Template Panel

Access: via Main Menu - 'Primary' - 'Template Table'

The template determines the location of each picture segment, the space to be allocated to it, and related properties relevant to its display. VCS treats the template as one of the three primary elements. *Note: the 'default' template cannot be removed or edited.*

How to Use the Template Panel

Selecting a Template Attribute Set:
Move the pointer over the desired template name and click the left mouse button. The Template Browser Panel (see associated Hints) will appear below.

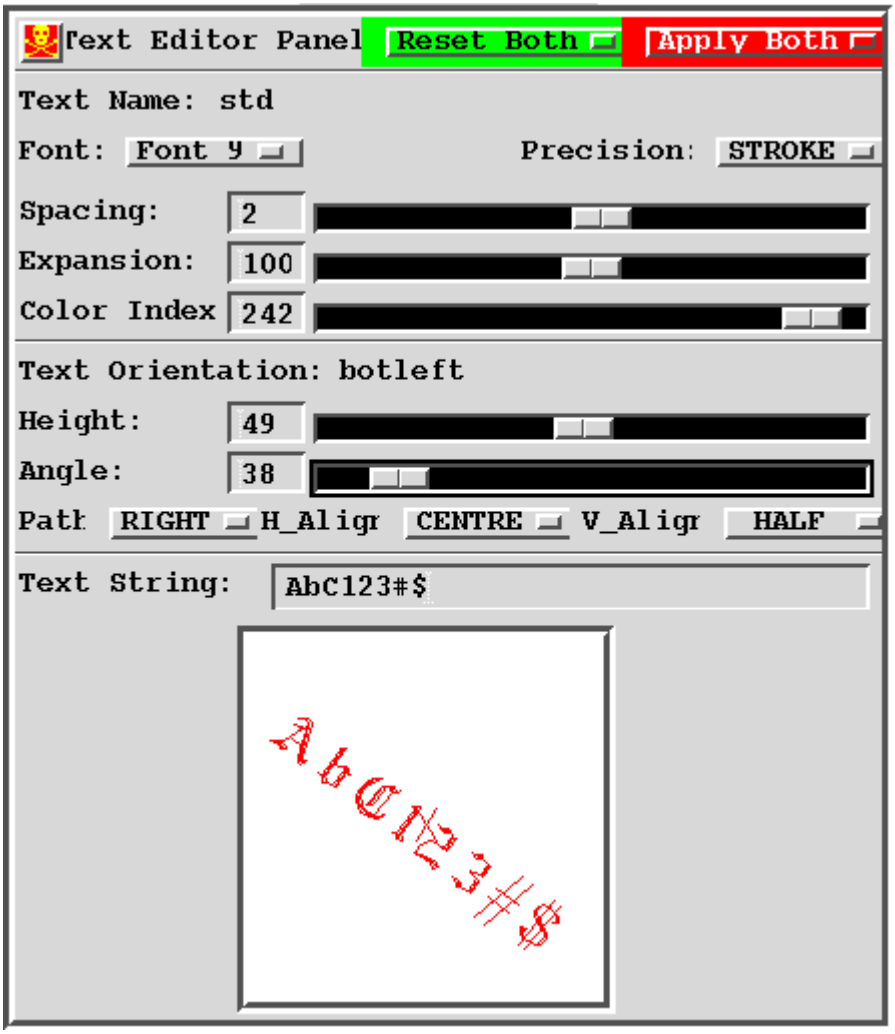
Copying and Dropping a Template:
To copy a template, move the pointer over the desired template name and click the *middle* mouse button. To drop, move the pointer to the green input text window on the Page Description Panel (located above the Template Panel), and click the *middle* mouse button.

Removing a Template:
Move the pointer over the template name to be removed and click the *right* mouse button.

Using the 'Template' Menu Button:
Selecting the 'Template' button displays a menu that allows the user to 'Copy', 'Rename', 'Script', or 'Remove' a selected template attribute set.

VCS Hints: Text Editor Panel

Access: via (Tt) Text Table Panel - Attribute Set Name



The Text Editor Panel allows editing of text attributes or text orientation attributes. *Note however, the Text Editor will not allow editing of the '(Tt)' 'default' text attributes or of the '(To)' 'default', 'defcenter', 'defright', 'defcentdown', or 'defcentup' text orientation attributes.*

How to Use the Text Editor Panel

Changing the Font:
Nine different font types are supported:

- SanSerif Roman
- Serif Roman
- Sanserif Bold Roman
- Serif Bold Roman

- Sanserif Italic Roman
- Serif Italic Roman
- Sanserif Script
- Serif Script
- Gothic

(These font types pertain only to text on the VCS Canvas. See the **Setup Information on Running VCS** for information on changing the fonts in other windows of the VCS Interface.) Move the pointer to the 'Font' menu button and press and hold the left mouse button. Then move the pointer to the desired font and release the left mouse button. The change will appear on the canvas below. Select the red 'Apply' button to register changes. *Note: if the text attribute set name is 'default', no change will occur.*

Changing the Text Spacing:
Move the pointer over the 'Spacing' slider bar and press and hold down the left mouse button. Then move the slider bar to the desired location--the text displayed on the canvas below will change accordingly. The desired number can also be entered in the 'Spacing' input text window. *Note: if the text attribute set name is 'default', no change will occur.*

Changing the Character Expansion:
Move the pointer over the 'Expansion' slider bar and press and hold the left mouse button. Then move the slider bar to the desired location--the text displayed on the canvas below will change accordingly. The desired number can also be entered in the 'Expansion' input text window. *Note: if the text attribute set name is 'default', no change will occur.*

Changing the Text Color:
Move the pointer over the 'Color Index' slider bar and press and hold the left mouse button. Then move the slider bar to the desired location--the text displayed on the canvas below will change accordingly. The desired number can also be entered in the 'Color Index' input text window. *Note: if the text attribute set name is 'default', no change will occur.*

Changing the Character Height:
Move the pointer over the 'Character Height' slider bar and press and hold the left mouse button. Then move the slider bar to the desired location--the text displayed on the canvas below will change accordingly. The desired number can also be entered in the 'Character Height' input text window. *Note: if the text orientation attribute set name is 'default', 'defcenter', 'defright', 'defcentdown', or 'defcentup', no change will occur.*

Changing the Text Angle:
Move the pointer over the 'Text Angle' slider bar and press and hold the left mouse button. Then move the slider bar to the desired location--the text displayed on the canvas below will change accordingly. The desired number can also be entered in the 'Text Angle' input text window. *Note: if the text orientation attribute set name is 'default', 'defcenter', 'defright', 'defcentdown', or 'defcentup', no change will occur.*

Changing the Text Path:
There are four different text path selections. Move the pointer to the 'Path' menu button and press and hold the left mouse button. Then move the pointer to the desired text path name and release the left mouse button--the canvas below will change to show the selected text path. *Note: if the text orientation attribute set name is 'default', 'defcenter', 'defright', 'defcentdown', or 'defcentup', no change will occur.*

Changing the Horizontal Alignment:
There are three different horizontal alignment selections. Move the pointer to the 'H_Align' menu button and press and hold the left mouse button. Then move the pointer to the desired horizontal alignment name and release the left mouse button--the canvas below will change to show the selected horizontal alignment. *Note: if the text orientation*

attribute set name is 'default', 'defcenter', 'defright', 'defcentdown', or 'defcentup', no change will occur.

Changing the Vertical Alignment:
There are five different vertical alignment selections. Move the pointer to the 'V_Align' menu button and press and hold the left mouse button. Then move the pointer to the desired vertical alignment name and release the left mouse button--the canvas below will change to show the selected vertical alignment. *Note: if the text orientation attribute set name is 'default', 'defcenter', 'defright', 'defcentdown', or 'defcentup', no change will occur.*

VCS Hints: (Tf) Fillarea Table Panel

Access: via Main Menu - 'Basic' - 'Fillarea Table (Tf)'

The (Tf) Fillarea Table Panel lists fillarea attribute set names that define the fillarea style, style index, and color index. VCS treats the fillarea attribute as one of the eight secondary elements that are used in describing the three primary elements (template, graphics method, data). *Note: the 'default' fillarea cannot be removed or edited.*

How to Use the (Tf) Fillarea Table Panel

Selecting Fillarea:
Move the pointer over the fillarea attribute set name and click the left mouse button. The Fillarea Editor Panel will appear below.

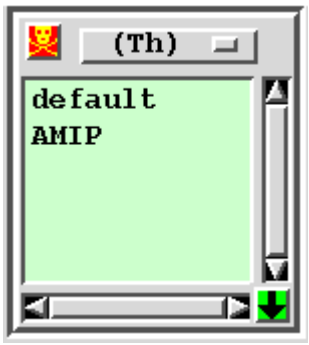
Copying and Dropping Fillarea:
To copy fillarea, move the pointer over the desired fillarea attribute set name and click the *middle* mouse button. To drop, move the pointer to a text window slot that has the same olive green color as the (Tf) Table, and click the *middle* mouse button.

Removing Fillarea:
Move the pointer over the fillarea attribute set name to be removed and click the *right* mouse button.

Using the '(Tf)' Menu Button:
Selecting the '(Tf)' button displays a menu that allows the user to 'Copy', 'Rename', 'Script', or 'Remove' a selected fillarea attribute set.

VCS Hints: (Th) Format Table Panel

Access: via Main Menu - 'Basic' - 'Format Table (Th)'



The (Th) Format Table Panel lists format attribute set names that define the format, name, and units of a dimension. VCS treats the format attribute as one of the eight secondary elements that are used in describing the three primary elements (template, graphics method, data). *Note: the 'default' format cannot be removed or edited.*

How to Use the (Th) Format Table Panel
Selecting a Format:
Move the pointer over the desired format attribute set name and click the left mouse button. The Format Editor Panel will appear below.

Copying and Dropping a Format:
To copy format, move the pointer over the desired format attribute set name and click the *middle* mouse button. To drop, move the pointer to a text window slot that has the same light green color as the (Th) Table, and click the *middle* mouse button.

Removing a Format:
Move the pointer over the format attribute set name to be removed and click the *right* mouse button.

Using the '(Th)' Menu Button:
Selecting the '(Th)' button displays a menu that allows the user to 'Copy', 'Rename', 'Script', or 'Remove' a selected format attribute set.

VCS Hints: (Tl) Line Table Panel

Access: via Main Menu - 'Basic' - 'Line Table (Tl)'

The (Tl) Line Table Panel contains a list of line attribute names that define the line type, width, and color index.

VCS treats the line attribute as one of the eight secondary elements that are used in describing the three primary elements (template, graphics method, data). *Note: the 'default' line cannot be removed or edited.*

How to Use the (Tl) Line Table Panel

Selecting Line:
Move the pointer over the desired line attribute set name and click the left mouse button. The Line Editor Panel will appear below.

Copying and Dropping Line:
To copy line, move the pointer over the desired line name and click the *middle* mouse button. To drop, move the pointer to a text window slot that has the same cyan color as the (Tl) Table, and click the *middle* mouse button.

Removing Line:
Move the pointer over the line attribute set name to be removed and click the right mouse button.

Using the '(Tl)' Menu Button:
Selecting the '(Tl)' button displays a menu that allows the user to 'Copy', 'Rename', 'Script', or 'Remove' a selected line attribute set.

VCS Hints: (Tm) Marker Table Panel

Access: via Main Menu - 'Basic' - 'Marker Table (Tm)'

The (Tm) Marker Table Panel lists marker attribute set names that define the marker type, size, and color index. VCS treats the marker attribute as one of the eight secondary elements that are used in describing the three primary elements (template, graphics method, data). *Note: the 'default' marker cannot be removed or edited.*

How to Use the (Tm) Marker Table Panel

Selecting a Marker:
Move the pointer over the desired marker attribute set name and click the left mouse button. The Marker Editor Panel will appear below.

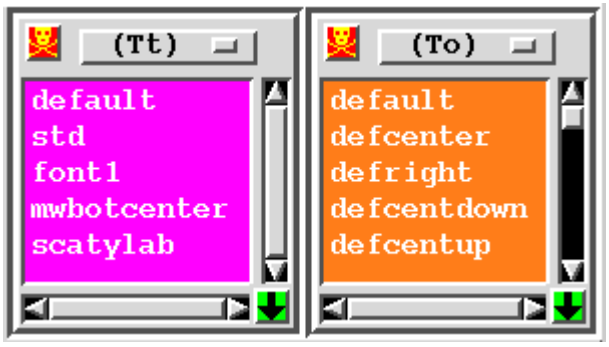
Copying and Dropping a Marker:
To copy a marker, move the pointer over the desired marker attribute set name and click the *middle* mouse button. To drop, move the pointer to a text window slot that has the same brown color as the (Tm) Table, and click the *middle* mouse button.

Removing a Marker:
Move the pointer over the marker attribute set name to be removed and click the right mouse button.

Using the '(Tm)' Menu Button:
Selecting the '(Tm)' button displays a menu that allows the user to 'Copy', 'Rename', 'Script', or 'Remove' a selected marker attribute set.

VCS Hints: (Tt) Text Table and (To) Text Orientation Table Panels

Access: via Main Menu - 'Basic' - 'Text Table (Tt) and (To)'



The (Tt) Text and (To) Text Orientation Tables are displayed simultaneously.

The (Tt) Text Table lists text attribute set names that define the font, spacing, expansion, and color index. VCS treats the text attribute as one of the eight secondary elements that are used in describing the three primary elements (template, graphics method, data). *Note: the 'default' text cannot be removed or edited.*

The (To) Text Orientation Table lists text orientation attribute set names that define the character height, angle, path, and horizontal and vertical alignment. VCS treats the text orietation attribute as one of the eight secondary elements that are used in describing the three primary elements (template, graphics method, data). *Note: the 'default', 'defcenter', 'defright', 'defcentdown', and 'defcentup' text orientation cannot be removed or edited.*

How to Use the (Tt) Text and (To) Text Orientation Table Panels

Selecting Text or Text Orientation:
Move the pointer over the desired text or text orientation attribute set name and click the left mouse button. The Text Editor Panel will appear below.

Copying and Dropping Text:
To copy text, move the pointer over the desired text attribute set name and click the *middle* mouse button. To drop, move the pointer to a text window slot that has the same magenta color as the (Tt) Table, and click the *middle* mouse button.

Copying and Dropping Text Orientation:
To copy text orientation, move the pointer over the desired text orientation attribute set name and click the *middle* mouse button. To drop, move the pointer to a text orientation window slot that has the same orange color as the (To) table, and click the *middle* mouse button.

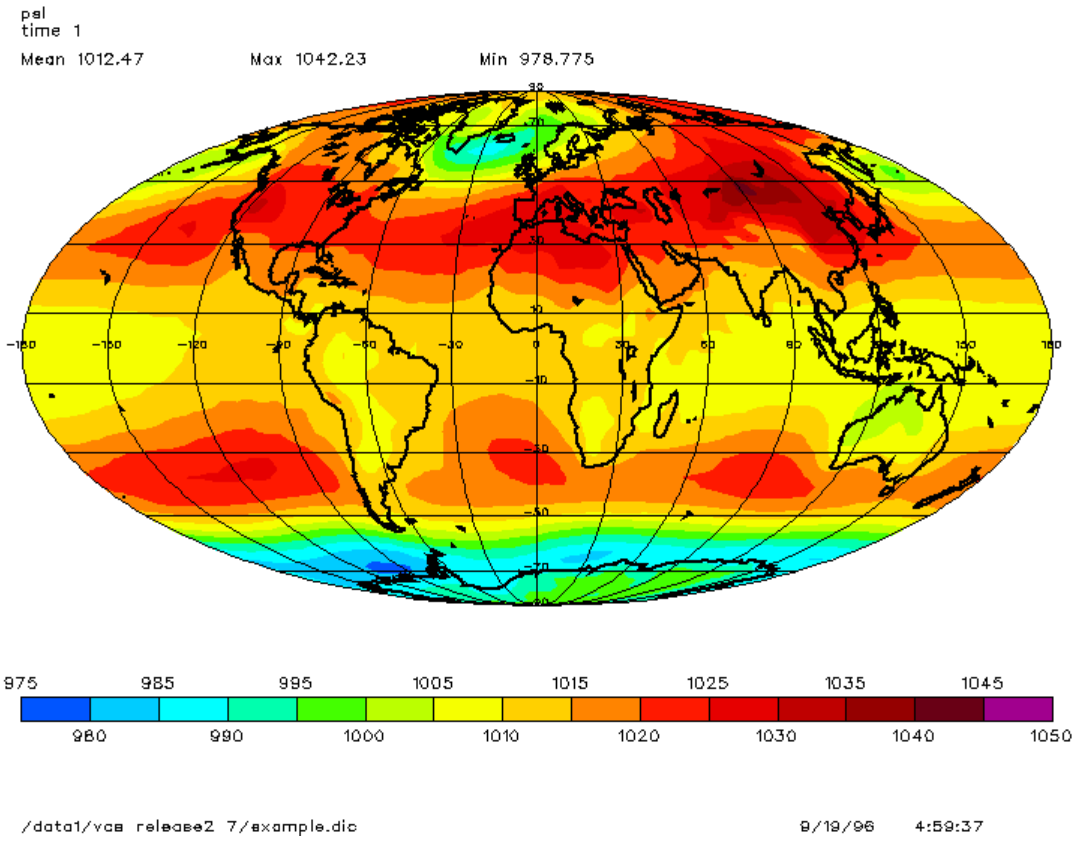
Removing Text or Text Orientation:
Move the pointer over the text or text orientation attribute set name to be removed and click the *right* mouse button.

Using the '(Tt)' Menu Button:
Selecting the '(Tt)' button displays a menu that allows the user to 'Copy', 'Rename', 'Script', or 'Remove' a selected text attribute set.

Using the '(To)' Menu Button:
Selecting the '(To)' button displays a menu that allows the user to 'Copy', 'Rename', 'Script', or 'Remove' a selected text orientation attribute set.

VCS Hints: VCS Canvas

Access: via Main Menu - 'Canvas' - 'Landscape', 'Canvas' - 'Portrait', 'Canvas' - 'Zoom Data', 'Canvas' - 'Zoom Screen', 'Canvas' - 'Full Screen'



The Canvas is used to display plots, create and run animations, and modify templates in VCS. It is always visible on the screen in a landscape (width exceeding height), portrait (height exceeding width), or full-screen mode.

How to Use the VCS Canvas

Designating Landscape Layout:
To view the Canvas in landscape mode, move the pointer to the 'Canvas' pull down menu. Press and hold the left mouse button, then move the pointer over the 'Landscape' option and release. The Canvas layout will change accordingly.

Designating Portrait Layout:
To view the Canvas in portrait mode, move the pointer to the 'Canvas' pull down menu option. Press and hold the left mouse button, then move the pointer over the 'Portrait' option and release. The Canvas layout will change accordingly.

Zooming in on Canvas Data:
To zoom in on the data that is displayed on the Canvas, move the pointer inside the Canvas and mark the image with the left mouse button. With the *middle* mouse button, hold down and move the pointer to the bottom of the image to

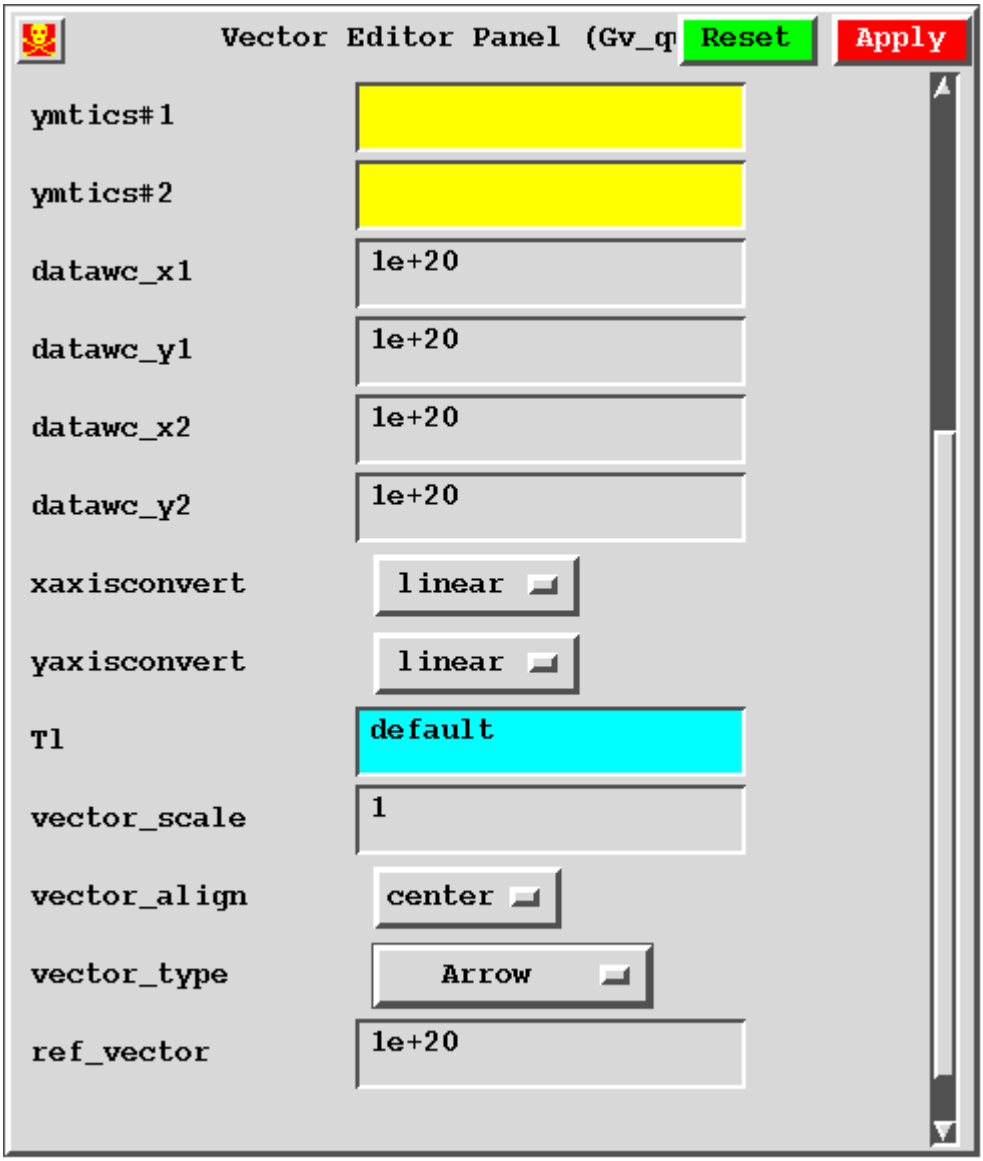
be zoomed. A box outlining this image will be displayed. Release the *middle* mouse button to display the data of the selected area. Click the *right* mouse button to restore to the original data. Also see the 'Dimension Manipulation Panel' for selecting a subset of the data via coordinates.

Zooming in on Canvas Image:
To zoom in on an image that is displayed on the Canvas, move the pointer inside the Canvas and mark the image with the left mouse button. With the *middle* mouse button, hold down and move the pointer to the bottom of the image to be zoomed. A box outlining this image will be displayed. Release the middle mouse button to zoom in on the outlined box. Click the *right* mouse button to restore the original image.

Designating Full-Screen Canvas:
To view the Canvas in full-screen mode, move the pointer to the 'Canvas' pull down menu. Press and hold the left mouse button, then move the pointer over 'Full Screen' option and release. The Canvas will cover all VCS panels and buttons, with the exception of the red 'Restore Size' button, which can be selected to restore the Canvas to its former size.

VCS Hints: Vector Editor Panel

Access: via Vector Graphics Method Panel - Attribute Set Name



The Vector Editor Panel displays the attribute set names and assignment values of the vector graphics method. The primary purpose of the vector graphics method is to display a vector plot of a 2D vector field. Vectors are located at the coordinate locations and point in the direction of the data vector field. Vector magnitudes are the product of data vector field lengths and a scaling factor.

How to Use the Vector Editor Panel

Changing the Map Projection:
Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button (in upper right corner) to register changes.

Setting a List Name for Labels and Tick Marks:
Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks; 'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new attribute set name into the yellow input text window (see associated Hints for copy and drop procedures).

Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

Converting the X-, Y-axis:
The x- and y-axis for the vector graphics method can be changed from linear (the default setting) to: log base 10 (log10), natural log (ln), exponential (exp), or area weighted (area_wt). Move the pointer over the 'xaxisconvert' or 'yaxisconvert' menu button and press and hold the left mouse button. Then move the pointer over the desired axis transformation and release the left mouse button. Select the red 'Apply' button to register changes.

Changing the Line Type:
To change the vector line type, access the (Tl) Line Table Panel (via Main Menu - 'Basic' - 'Line Table (Tl)'). To copy a line type, move the pointer to the desired line attribute set name and click the *middle* mouse button. To drop, move the pointer to the cyan 'Tl' input text window on the Vector Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

Setting the Vector Scale Value:
Move the pointer to the 'vector_scale' input text window and click the left mouse button. Enter the desired vector scale value.

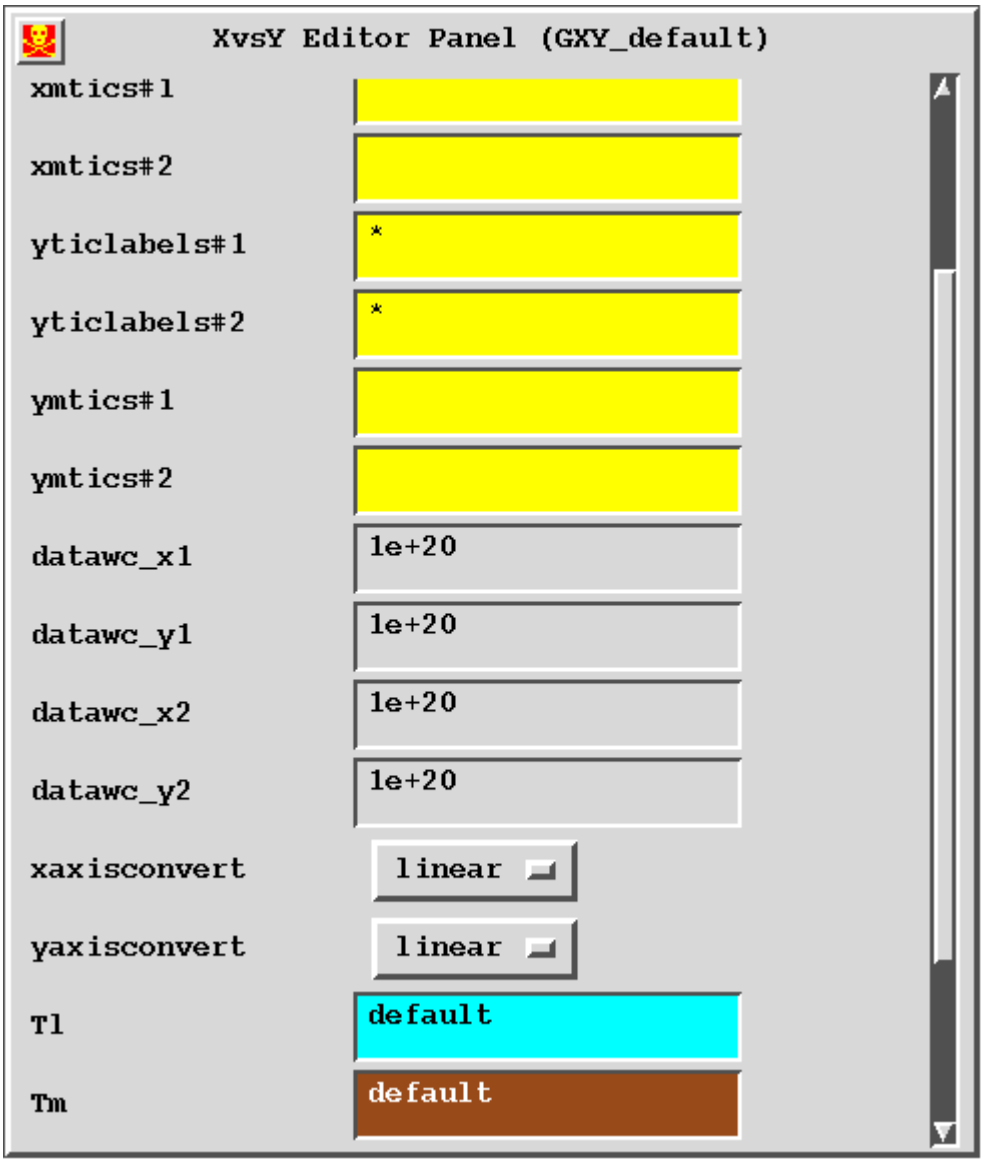
Setting the Vector Alignment:
Move the pointer over the 'vector_align' menu button and press and hold the left mouse button. Then move the pointer over the desired alignment: tail, center, head.

Setting the Vector Type:
Move the pointer to the 'vector_type' menu button and press and hold the left mouse button. Then move the pointer over the desired vector type: wind barbs, arrow, or solid arrow.

Setting the Vector Reference:
The vector reference defines the size of the vector in response to the data. Move the pointer to the 'ref_vector' input text window and click the left mouse button. Then enter the desired reference value. (A value of '1.e+20' cues VCS to select the reference vector.) Select the red 'Apply' button to register changes.

VCS Hints: XvsY Editor Panel

Access: via XvsY Graphics Method Panel - Attribute Set Name



The XvsY Editor Panel displays the attribute set names and assignment values for the XvsY graphics method. The XvsY graphics method displays a line plot from two 1D data arrays, that is X(t) and Y(t), where t represents the 1D coordinate values.

How to Use the XvsY Editor Panel

Changing the Map Projection:

Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button (in upper right corner) to register changes.

Setting a List Name for Labels and Tick Marks:
Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks; 'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new attribute set name into the yellow input text window (see associated Hints for copy and drop procedures).

Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

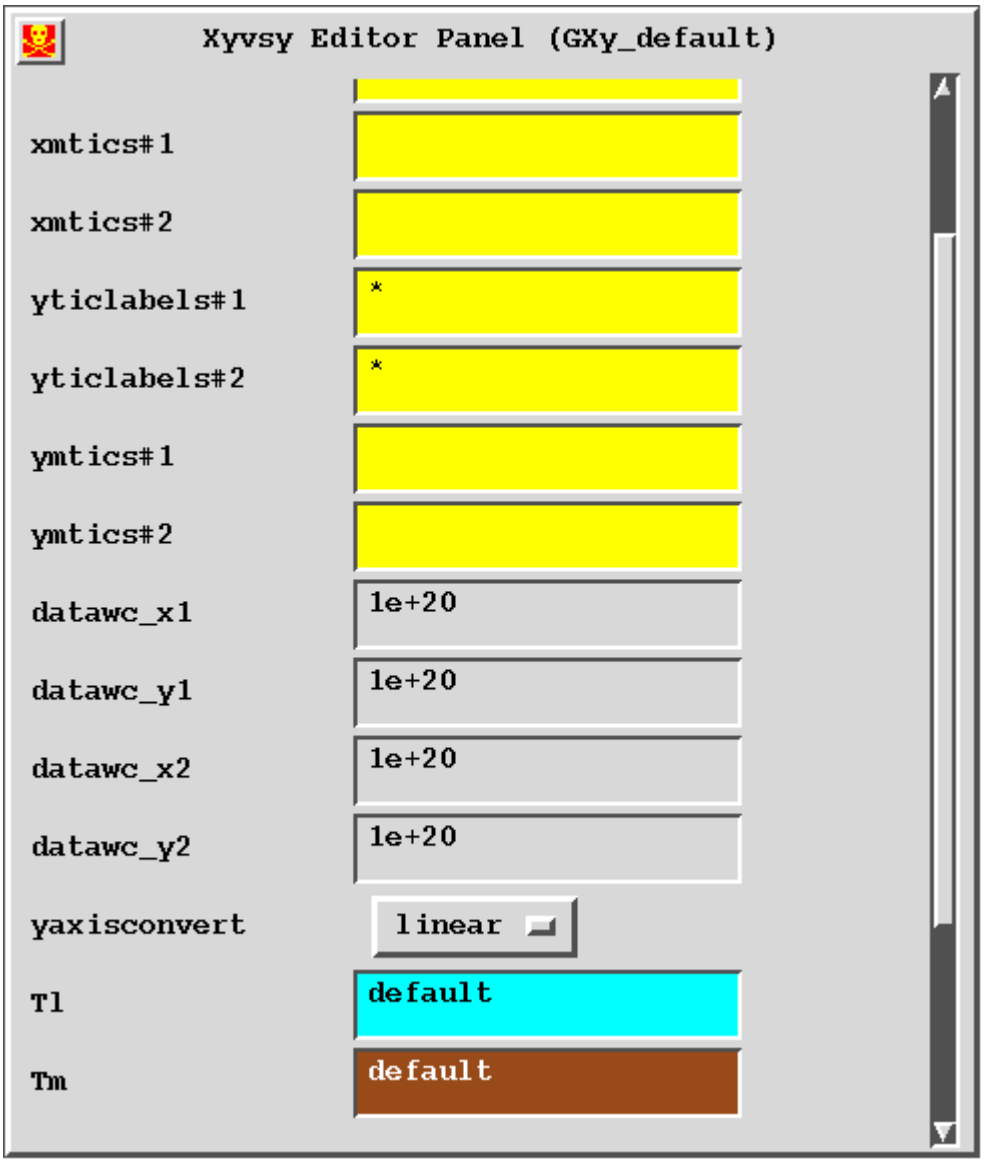
Converting the X-, Y-axis:
The x- and y-axis for the XvsY graphics method can be changed from linear (the default setting) to: log base 10 (log10), natural log (ln), exponential (exp), or area weighted (area_wt). Move the pointer over the 'xaxisconvert' or 'yaxisconvert' menu button and press and hold the left mouse button. Then move the pointer over the desired axis transformation and release the left mouse button. Select the red 'Apply' button to register changes.

Changing the Line Type:
To change the XvsY line type, access the (Tl) Line Table Panel (via Main Menu - 'Basic' - 'Line Table (Tl)'). To copy a line type, move the pointer to the desired line attribute set name and click the *middle* mouse button. To drop, move the pointer to the cyan 'Tl' input text window of the XvsY Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

Changing the Marker Type:
To change the XvsY marker type, access the (Tm) Marker Table Panel (via Main Menu - 'Basic' - 'Marker Table (Tm)'). To copy a marker type, move the pointer to the desired marker attribute set name and click the *middle* mouse button. To drop, move the pointer to the brown 'Tm' input text window on the XvsY Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

VCS Hints: Xyvsy Editor Panel

Access: via Xyvsy Graphics Method Panel - Attribute Set Name



The Xyvsy Editor Panel displays the attribute set names and assignment values of the Xyvsy graphics method. The Xyvsy graphics method displays a line plot from a 1D data array, that is X(y), where y represents the 1D coordinate values.

How to Use the Xyvsy Editor Panel

Changing the Map Projection:

Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button to register changes.

Setting a List Name for Labels and Tick Marks:

Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks;

'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new attribute set name into the yellow input text window.

Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

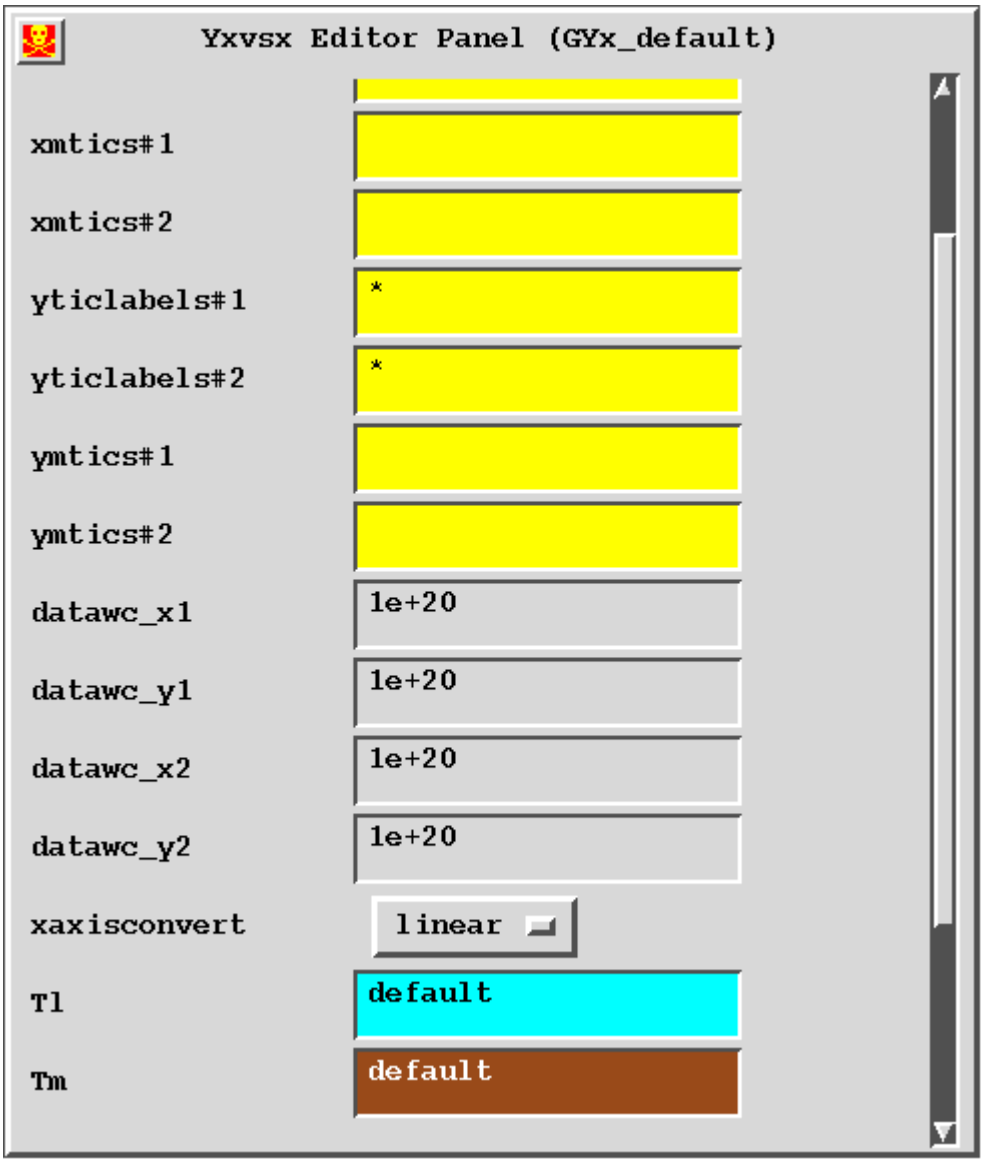
Converting the X-, Y-axis:
The x- and y-axis for the Xyvsy graphics method can be changed from linear (the default setting) to: log base 10 (log10), natural log (ln), exponential (exp), or area weighted (area_wt). Move the pointer over the 'xaxisconvert' or 'yaxisconvert' menu button and press and hold the left mouse button. Then move the pointer over the desired axis transformation and release the left mouse button. Select the red 'Apply' button to register changes.

Changing the Line Type:
To change the Xyvsy line type, access the (Tl) Line Table Panel (via Main Menu - 'Basic' - 'Line Table (Tl)'). To copy a line type, move the pointer to the desired line attribute set name and click the *middle* mouse button. To drop, move the pointer to the cyan 'Tl' input text window of the Xyvsy Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

Changing the Marker Type:
To change the Xyvsy marker type, access the (Tm) Marker Table Panel (via Main Menu - 'Basic' - 'Marker Table (Tm)'). To copy a marker type, move the pointer to the desired marker attribute set name and click the *middle* mouse button. To drop, move the pointer to the brown 'Tm' input text window on the Xyvsy Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

VCS Hints: Yxvsx Editor Panel

Access: via Yxvsx Graphics Method Panel - Attribute Set Name



The Yxvsx Editor Panel displays the attribute set names and assignment values of the Yxvsx graphics method. The Yxvsx graphics method displays a line plot from a 1D data array, that is Y(x), where x represents the 1D coordinate values.

How to Use the Yxvsx Editor Panel

Changing the Map Projection:
Move the pointer over the 'projection' menu button and press and hold the left mouse button. Then move the pointer over the desired map projection and release the left mouse button. Select the red 'Apply' button to register changes.

Setting a List Name for Labels and Tick Marks:
Labels and tick marks are: 'xticlabels#1', bottom prefixed list name for x-axis labels and ticks; 'xticklabels#2', top prefixed list name for x-axis labels and ticks; 'xmtics#1, left prefixed list name for x-axis minor ticks; xmtics#2, right prefixed list name for x-axis minor ticks; 'yticlabels#1', left prefixed list name for y-axis labels and ticks; 'yticlabels#2', right prefixed list name for y-axis labels and ticks; 'ymtics#1', right prefixed list name for y-axis minor ticks; 'ymtics#2', left prefixed list name for y-axis minor ticks. From the List Table Panel, copy and drop the new attribute set name into the yellow input text window.

Defining Data Space in Real-World Coordinates:
The data space defined in the picture template in normalized device coordinates is mapped to the real-world coordinates given: 'datawc_x1', 'datawc_x2', 'datawc_y1', 'datawc_y2'. A value of '1e+20' cues VCS to use the data coordinate values.

Converting the X-, Y-axis:
The x- and y-axis for the Yxvsx graphics method can be changed from linear (the default setting) to: log base 10 (log10), natural log (ln), exponential (exp), or area weighted (area_wt). Move the pointer over the 'xaxisconvert' or 'yaxisconvert' menu button and press and hold the left mouse button. Then move the pointer over the desired axis transformation and release the left mouse button. Select the red 'Apply' button to register changes.

Changing the Line Type:
To change the Yxvsx line type, access the (Tl) Line Table Panel (via Main Menu - 'Basic' - 'Line Table (Tl)'). To copy a line type, move the pointer to the desired line attribute set name and click the *middle* mouse button. To drop, move the pointer to the cyan 'Tl' input text window on the Yxvsx Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

Changing the Marker Type:
To change the Yxvsx marker type, access the (Tm) Marker Table Panel (via Main Menu - 'Basic' - 'Marker Table (Tm)'). To copy a marker type, move the pointer to the desired marker attribute set name and click the *middle* mouse button. To drop, move the pointer to the brown 'Tm' input text window on the Yxvsx Editor Panel and click the *middle* mouse button. Select the red 'Apply' button to register changes.

4. VCS Scripts

Introduction to VCS Scripting

Many attributes are needed to create a graphical representation of a variable, e.g. attributes to identify the variable and to label the plotting axes. By use of VCS scripts, most of these attributes can be manipulated to create the desired visual effect, and the resulting attributes can be saved for later use. VCS scripts also allow the user to save a sequence of interactive operations for replay, and to recover from a system failure.

Initial Attributes Script

As a part of its initialization, VCS reads a script file ***initial.attributes*** to load the tables of primary and secondary elements with a variety of attribute sets. Although not required to run VCS, this ***initial.attributes*** file contains many predefined attribute settings to aid the beginning user of VCS. The path to the file *must be*

/$HOME/PCMDI_GRAPHICS/initial.attributes

where ***/$HOME*** denotes the user's home directory. (*Note, when VCS is executed for the first time, a* ***/PCMDI_GRAPHICS*** *subdirectory will be created automatically if one has not already been created.*) The user also can customize the ***initial.attributes*** file.

Follow-on Script

Another script file can be read immediately after the ***initial.attributes*** script file. It is assigned on the command line by entering

vcs -i ***/path/input_script_filename***

or

vcs -ni ***/path/input_script_filename***

when executing VCS.

During the reading of the ***input_script_filename***, VCS operates in a batch-like mode: the VCS Canvas may appear with graphical displays, but will eventually disappear. If the **-i** option is exercised, control will become interactive once the ***input_script_filename*** has been read, and the VCS Interface will appear, showing the last plot displayed in batch mode. If the **-ni** option is exercised, VCS will exit without displaying the interactive Interface, once the ***input_script_filename*** has been read.

Saving a Continuous Script

A continuous script can be saved during an interactive session by assigning an output file on the command line:

vcs -o ***/path/output_script_filename***

The replay of this output script file will not reproduce the manipulations of buttons and menus that are seen during the interactive session, but will reproduce the graphical displays and the changes to the tables and their attributes sets. The appropriate CGM, raster, netCDF, HDF, and/or DRS files also will be saved. (See also the Example on saving these types of files.)

Saving Error Messages

During the processing of the ***initial.attributes*** script file, any error message will be written to the UNIX standard output file. During the processing of the input file defined by the **-i** option, the error message will, by default, be written to the file

/$HOME/PCMDI_GRAPHICS/ERROR_GRAPHICS

These error messages can optionally be saved to a file dictated by the user with the command line option

vcs -e ***/path/error_output_filename***

The errors occurring during the interactive portion of a VCS session will be sent both to the VCS message panel and to the error file. See also the section on VCS Command Line Options in the Setup Information.

Script Assignment Statements

In an assignment statement, the specific table of attribute sets is identified by a prefix, and the table entry is specified by a name for the attribute set; they are separated by an underline. Attribute assignments are enclosed within parentheses. The syntax is:

tableprefix_attributename(assignments)

where:

tableprefix identifies the table

attributename names the attribute set that will appear in the table

assignments can be specified in any of the following forms:

attributename=assignment

attributename(assignment,assignment,...),

attributename(sub-attributename = assignment, ...),

attributename(sub-attributename = assignment, ...)(another set)...,

where:

assignment=value or 'string' or attribute set name

Other Actions

There are also script commands for performing various actions. Examples include:

- opening the VCS Canvas
- capturing the display page drawn on the VCS Canvas, either as a CGM file or a raster image
- changing values of the indices (I,J,K,L,M,N)
- looping indices over ranges of values while saving CGM or raster images
- alternating between portrait and landscape orientation of the VCS Canvas
- dumping the state of the system into a script file
- assigning a colormap table entry as the active colormap
- copying, renaming, and removing entries in the primary and secondary elements tables
- running a script file

VCS Scripting Primary Element Attribute Sets

In the VCS model, the data display is defined by a trio of named attribute sets, designated the primary elements. These include the data, which define what is to be displayed; the picture template, which determines the appearance of each segment of the display; and the graphics method, which specifies the display technique. *Note, there is one table of attribute sets for the array data and for the picture template, but there is a different table of attribute sets for each of the graphics methods.*

VCS Scripts: Scripting Array Data Attributes: A_name

Description

Array Data attributes specify the properties of a data variable, such as its source, title, name, type, and units, as well as features of its dimensions (X,Y,Z,T), e.g. names, bounds, and wrap-around parameters. For array data attributes, a distinction is drawn between attributes that pertain to "defined" variables versus "displayed" variables. See also examples on Selecting and Browsing Data and on Modifying Data.

Minimal Information Required to Select or Compute a Variable

Variables can be either selected from a file, or computed as a function of previously selected variables. To compute a variable, it is only necessary to assign a valid **Function** attribute (i.e., the right hand side of an equation). All other information is determined from the attributes of the variable(s) used in the equation. See also the Example on Computing a New Variable.

Defined Versus Displayed Array Data Attributes

The attributes described above are termed the "defined" array data attributes. Another similar set, termed the "displayed" attributes , is available for specifying details of the data display. The displayed attributes are, by default, determined from the defined attributes, but they can instead be assigned explicitly. Because many of the displayed attributes have the same names as the defined attributes, to distinguish the two types, the displayed attributes are written in lower case, while the defined attributes are capitalized.

Defined *dimension* attributes should never be assigned, unless

- dimensions are to be transposed, in which case the affected dimension names (**XName, YName, Zname, Tname**) need to be supplied in transposed order (see Hints on the Data Manipulation Panel)
- a dimension is to be wrapped around, which makes it necessary to assign wrap indices (**XKwrap, YKwrap, ZKwrap, TKwrap**) and cycle values (**XCycle, YCycle, ZCycle, TCycle**) (see Hints on the Data Manipulation Panel)

The only instance when the defined range on (**XFirst, Xlast**) or (**YFirst, Ylast**) or (**ZFirst, Zlast**) or (**TFirst, Tlast**) must be specified is when the dimension is to be wrapped, but the entire set of dimension values is not to be wrapped.

The displayed dimension attributes need not be assigned unless a subset, reversal, stride, or random selection of dimensions is needed, or unless a grid transformation is to be performed:

- Subset and reversal require defining the range (**xfirst, xlast**), or (**yfirst, ylast**), or (**zfirst, zlast**), or (**tfirst, tlast**).
- Stride selection requires specifying the jump interval (**xjump, yjump, zjump, tjump**) and possibly also a range.
- Random selection requires specifying the node values of the randomly selected nodes (**xvalue, yvalue, zvalue, tvalue**).
- Grid transformation requires that the node values (**xvalue, yvalue, zvalue, tvalue**) be specified, and it is best also to specify the weights (**xweight, yweight, zweight, tweight**) and bounds (**xbound, ybound, zbound, tbound**).

If any defined or displayed dimension attribute is assigned, then that dimension name and all prior dimension names (**XName, YName, Zname, Tname**) must appear in the desired order.

Duplication of attributes also is required is when a variable is computed: its attributes are taken from the first variable in the equation, and others as needed. It is desirable to assign new naming strings (**source, name, title, units**) to describe the computed variable.

All array data attributes that are assigned by the user are preserved. An array data attribute set therefore can be reassigned by altering only the previous assignments made by the user. If any change is made to an array data attribute set, its defined and displayed attributes are discarded, and only the previously assigned values are retained. The changes are applied to the previously assigned attributes, and the unassigned attributes are refilled, as before.

VCS recognizes dimensions named **latitude** and **longitude**. If no other assignments have been made, VCS sets the range for **latitude** to **(x, y, z, t)first=-90** and **(x, y, z, t)last=90**, and sets the range for **longitude** to **(x, y, z, t)first=-180** and **(x, y, z, t)last=180**. VCS also sets wrap indices **(X, Y, Z, T)Kwrap** and cycle values **(X, Y, Z, or T)Cycle=360** as needed.

Order of Array Dimensions

Array data may have as many as four dimensions **(X,Y,Z,T)**, and any or all of these dimensions may be single-valued. Of course, single-valued dimensions can be in any position without affecting the order of the data. However, even when dimensions are single-valued, it is necessary to request data dimensions in the desired order in order to visualize the data.

For example, in two-dimensional graphics methods the **X** dimension is defined on the horizontal axis and the **Y** dimension is defined on the vertical axis. Single values must be chosen for the dimensions that are not used by the graphics method. The single-valued dimensions can have their values formatted to text and displayed in segments; when there is more than one dimension, their order can be important.

Assignments

The **A_name** statement is used to define a table entry or to change some or all of the attributes in an existing table entry:

A_name(

The file containing the selected data is named here:

File=*/path/filename*

If a functional assignment statement exists, it overrides any **File** assignment:

Function=assignment statement

The functional assignment statement consists of operands and operators. The operators are: add (+), subtract (-), multiply (*****), divide (/), and power (******). The operands can be either numbers or names of array data attribute sets or function references with arguments. Only one function (**sqrt**) is presently available in VCS, but others will be added in the future.

Each selected variable has a logical mask assigned as it is retrieved:

LogicalMask=logical assignment statement

By default, if the absolute value of any data value is greater than or equal to 10**20, that node point is masked out (mask value is **false**). A logical **and** operation is performed on the logical mask assigned here and the default mask. When a variable is used in a **Function** assignment statement, a similar logical **and** operation is performed on the masks of all the variables involved in the **Function** to form a mask for the computed variable.

The operators that can be used in this logical assignment statement are: greater than (), less than (<), equal (=), greater than or equal (=), and less than or equal (<=). The operands are variables, which can include the variable defined by this attribute set. Operands must have the same nonsingular dimensions as the ones defined by these array attributes. The dimensions need not be in the same order.

The default grid transformation can be changed for particular dimensions with the transform assignment:

Transform=transformation function (dimension name,...)

Default transform functions are defined for each dimension: **latitude** and **longitude** are area weighted (**awt**), and all other dimensions are transformed with linear interpolation (**linear**). Only these two methods are presently supported in VCS. See also the Example on Grid Transformations.

The following four character strings define the variable:

Source="description of data source" (120 character limit),
Name="name of the variable" (16 character limit),
Title="description of the variable" (80 character limit),
Units="units description for the variable" (40 character limit),

Note, in VCS scripts character strings are denoted by use of double quotes (".....").

It is necessary to specify enough of these strings to unambiguously determine the variable with respect to other variables in the **File**. If the variable is defined as a **Function** of other variables, these strings need not be supplied; they will become the same as the corresponding displayed attributes for the first variable in the assignment statement.

The following four character strings can be used to substitute naming strings that will be displayed:

source="substitute description of data source" (120 character limit),
name="substitute name of the variable" (16 character limit),
title="substitute description of the variable" (80 character limit),
units="substitute units description for the variable" (40 character limit),

If these strings are not supplied, they will be the same as the defined set of strings shown above.

The variable type and creation date and time are specified by

Type: data type, character (C*n), integer (I*n), or real (R*n)
CrDate: creation date of the data
CrTime: creation time of the data

Note, if these strings are already defined for the data, user assignments are overridden; however, the user is able to assign the corresponding displayed attributes:

type="data type", character (C*n), integer (I*n), or real (R*n),
crdate="substitute data creation date", (8 character limit),
crtime="substitute data creation time", (8 character limit)

The **crdate** and **crtime** may be displayed; the **type** will not be displayed, however.

The following four comment strings can be supplied and displayed:

comment#1="comment line for display only" (120 character limit),
comment#2="comment line for display only" (120 character limit),
comment#3="comment line for display only" (120 character limit),
comment#4="comment line for display only" (120 character limit)

Those dimensions for which attributes are to be assigned must have their names also assigned, and all prior dimensions must also be named, e.g.

XName="name of the 1st dimension" (16 character limit),
XUnits="units of the 1st dimension" (40 character limit)

A substitute for the defined dimension name and units can be specified for use on the display:

xname="substitute name of the 1st dimension" (16 character limit),
xunits="substitute units description of the 1st dimension" (40 character limit)

The order of dimensions can be assigned even when the variable is to be computed. If they are not assigned, the order is determined from the other variables by left-to-right examination of their dimensions.

The data can be wrapped around by specifying wrap indices, **XKwrap(k1,k2)**, and a cycle value **XCycle(C)**, so that a dimension then has values

X = x(i) + k*C (for all k=k1 to k2 and i = i1 to i2 for each k)

where **x(i1)=XFirst**, and **x(i2)=XLast**. For example, longitude can be wrapped negatively by 360 degrees and positively by 360 degrees with:

k1=-1 and k2=1 and C=360.

The range of values actually requested then can be defined within this larger range. The requested range is specified by **Xfirst** and **Xlast** below:

XKwrap=(first wrap index value,last wrap index value),
XCycle=wrap-around cycle,
XFirst=first value of wrap range,
XLast=last value of wrap range

The defined values, bounds, and weights can be assigned:

XValue: values of the first dimension nodes
XBound: values of the first dimension node boundaries
XWeight: weights to be used in computing weighted averages

These will be overridden by actual values computed, however. If a file name is specified, the bounds and weights will be sought from the same data file and, if not found, will be computed. After the bounds are determined, the weights are computed as the difference between bounds for each node, or as the difference between the sine of the bounds if the dimension is named **latitude**. If a **Function** is assigned, these values are taken from the first variable in the equation and as many subsequent variables as are necessary to fill all dimensions.

Every nth value of a dimension, beginning with **xfirst**, can be selected by specifying

xjump=n

By default, **xjump=1**.

The actual range of values chosen from a dimension (wrapped or not) is specified by **xfirst** and **xlast**, which also implies the direction of the dimension. However, if a grid transformation is specified by assigning a list of values for **xvalue**, then **xfirst** and **xlast** are given the first and last values of the list:

xfirst=first value of the selected range,
xlast= last value of the selected range

Values, bounds, and weights of the actual dimensions are determined from the defined values, or are computed, or are assigned as named lists, or as values. If assigned values do not coincide with actual nodes, then a grid transformation for the dimension is performed.

xvalue=list of values or actual values of the dimension nodes,
xbound=list of values or actual values of the node bounds,
xweight=list of values or actual values of the weights for each node

*Note, because the dimensions **Y**, **Z**, and **T** each have the same attributes as dimension **X**, the same assignments as for **Xname** to **xweight** above apply, except that **Y (y)**, **Z (z)**, or **T(t)** are substituted for **X (x)**.*

). End of the array data attributes.

Example Script

An example of an array data script follows:

A_psl(

File="/home/williams/example.nc",

Source="ECMWF ECMWFcycle 36 T42L19 AMIP 10 Year Simulation (1979-1988)",

Name="psl",

Title="Monthly Mean Sea Level Pressure",

Units="hPa",

XName="longitude",

YName="latitude",

ZName="time",

xjump=8,

yjump=8,

yfirst=-90.,

ylast=90.

)

VCS Scripting Primary Element Attribute Sets

In the VCS model, the data display is defined by a trio of named attribute sets, designated the primary elements. These include the data, which define what is to be displayed; the picture template, which determines the appearance of each segment of the display; and the graphics method, which specifies the display technique. *Note, there is one table of attribute sets for the array data and for the picture template, but there is a different table of attribute sets for each of the graphics methods.*

VCS Scripts: Scripting Array Data Attributes: A_name

Description

Array Data attributes specify the properties of a data variable, such as its source, title, name, type, and units, as well as features of its dimensions (X,Y,Z,T), e.g. names, bounds, and wrap-around parameters. For array data attributes, a distinction is drawn between attributes that pertain to "defined" variables versus "displayed" variables. See also examples on Selecting and Browsing Data and on Modifying Data.

Minimal Information Required to Select or Compute a Variable

Variables can be either selected from a file, or computed as a function of previously selected variables. To compute a variable, it is only necessary to assign a valid **Function** attribute (i.e., the right hand side of an equation). All other information is determined from the attributes of the variable(s) used in the equation. See also the Example on Computing a New Variable.

Defined Versus Displayed Array Data Attributes

The attributes described above are termed the "defined" array data attributes. Another similar set, termed the "displayed" attributes , is available for specifying details of the data display. The displayed attributes are, by default, determined from the defined attributes, but they can instead be assigned explicitly. Because many of the displayed attributes have the same names as the defined attributes, to distinguish the two types, the displayed attributes are written in lower case, while the defined attributes are capitalized.

Defined *dimension* attributes should never be assigned, unless

- dimensions are to be transposed, in which case the affected dimension names (**XName, YName, Zname, Tname**) need to be supplied in transposed order (see Hints on the Data Manipulation Panel)
- a dimension is to be wrapped around, which makes it necessary to assign wrap indices (**XKwrap, YKwrap, ZKwrap, TKwrap**) and cycle values (**XCycle, YCycle, ZCycle, TCycle**) (see Hints on the Data

Manipulation Panel)

The only instance when the defined range on (**XFirst, Xlast**) or (**YFirst, Ylast**) or (**ZFirst, Zlast**) or (**TFirst, Tlast**) must be specified is when the dimension is to be wrapped, but the entire set of dimension values is not to be wrapped.

The displayed dimension attributes need not be assigned unless a subset, reversal, stride, or random selection of dimensions is needed, or unless a grid transformation is to be performed:

- Subset and reversal require defining the range (**xfirst, xlast**), or (**yfirst, ylast**), or (**zfirst, zlast**), or (**tfirst, tlast**).
- Stride selection requires specifying the jump interval (**xjump, yjump, zjump, tjump**) and possibly also a range.
- Random selection requires specifying the node values of the randomly selected nodes (**xvalue, yvalue, zvalue, tvalue**).
- Grid transformation requires that the node values (**xvalue, yvalue, zvalue, tvalue**) be specified, and it is best also to specify the weights (**xweight, yweight, zweight, tweight**) and bounds (**xbound, ybound, zbound, tbound**).

If any defined or displayed dimension attribute is assigned, then that dimension name and all prior dimension names (**XName, YName, Zname, Tname**) must appear in the desired order.

Duplication of attributes also is required is when a variable is computed: its attributes are taken from the first variable in the equation, and others as needed. It is desirable to assign new naming strings (**source, name, title, units**) to describe the computed variable.

All array data attributes that are assigned by the user are preserved. An array data attribute set therefore can be reassigned by altering only the previous assignments made by the user. If any change is made to an array data attribute set, its defined and displayed attributes are discarded, and only the previously assigned values are retained. The changes are applied to the previously assigned attributes, and the unassigned attributes are refilled, as before.

VCS recognizes dimensions named **latitude** and **longitude**. If no other assignments have been made, VCS sets the range for **latitude** to **(x, y, z, t)first=-90** and **(x, y, z, t)last=90**, and sets the range for **longitude** to **(x, y, z, t)first=-180** and **(x, y, z, t)last=180**. VCS also sets wrap indices **(X, Y, Z, T)Kwrap** and cycle values **(X, Y, Z, or T)Cycle=360** as needed.

Order of Array Dimensions

Array data may have as many as four dimensions **(X,Y,Z,T)**, and any or all of these dimensions may be single-valued. Of course, single-valued dimensions can be in any position without affecting the order of the data. However, even when dimensions are single-valued, it is necessary to request data dimensions in the desired order in order to visualize the data.

For example, in two-dimensional graphics methods the **X** dimension is defined on the horizontal axis and the **Y** dimension is defined on the vertical axis. Single values must be chosen for the dimensions that are not used by the graphics method. The single-valued dimensions can have their values formatted to text and displayed in segments; when there is more than one dimension, their order can be important.

Assignments

The **A_name** statement is used to define a table entry or to change some or all of the attributes in an existing table entry:

A_name(

The file containing the selected data is named here:

File=*/path/filename*

If a functional assignment statement exists, it overrides any **File** assignment:

Function=assignment statement

The functional assignment statement consists of operands and operators. The operators are: add (+), subtract (-), multiply (*****), divide (*/*), and power (******). The operands can be either numbers or names of array data attribute sets or function references with arguments. Only one function (**sqrt**) is presently available in VCS, but others will be added in the future.

Each selected variable has a logical mask assigned as it is retrieved:

LogicalMask=logical assignment statement

By default, if the absolute value of any data value is greater than or equal to 10**20, that node point is masked out (mask value is **false**). A logical **and** operation is performed on the logical mask assigned here and the default mask. When a variable is used in a **Function** assignment statement, a similar logical **and** operation is performed on the masks of all the variables involved in the **Function** to form a mask for the computed variable.

The operators that can be used in this logical assignment statement are: greater than (), less than (<), equal (=), greater than or equal (=), and less than or equal (<=). The operands are variables, which can include the variable defined by this attribute set. Operands must have the same nonsingular dimensions as the ones defined by these array attributes. The dimensions need not be in the same order.

The default grid transformation can be changed for particular dimensions with the transform assignment:

Transform=transformation function (dimension name,...)

Default transform functions are defined for each dimension: **latitude** and **longitude** are area weighted (**awt**), and all other dimensions are transformed with linear interpolation (**linear**). Only these two methods are presently supported in VCS. See also the Example on Grid Transformations.

The following four character strings define the variable:

Source="description of data source" (120 character limit),
Name="name of the variable" (16 character limit),
Title="description of the variable" (80 character limit),
Units="units description for the variable" (40 character limit),

Note, in VCS scripts character strings are denoted by use of double quotes ("....").

It is necessary to specify enough of these strings to unambiguously determine the variable with respect to other variables in the **File**. If the variable is defined as a **Function** of other variables, these strings need not be supplied; they will become the same as the corresponding displayed attributes for the first variable in the assignment statement.

The following four character strings can be used to substitute naming strings that will be displayed:

source="substitute description of data source" (120 character limit),
name="substitute name of the variable" (16 character limit),
title="substitute description of the variable" (80 character limit),
units="substitute units description for the variable" (40 character limit),

If these strings are not supplied, they will be the same as the defined set of strings shown above.

The variable type and creation date and time are specified by

Type: data type, character (C*n), integer (I*n), or real (R*n)
CrDate: creation date of the data
CrTime: creation time of the data

Note, if these strings are already defined for the data, user assignments are overridden; however, the user is able to assign the corresponding displayed attributes:

type="data type", character (C*n), integer (I*n), or real (R*n),
crdate="substitute data creation date", (8 character limit),
crtime="substitute data creation time", (8 character limit)

The **crdate** and **crtime** may be displayed; the **type** will not be displayed, however.

The following four comment strings can be supplied and displayed:

comment#1="comment line for display only" (120 character limit),
comment#2="comment line for display only" (120 character limit),
comment#3="comment line for display only" (120 character limit),
comment#4="comment line for display only" (120 character limit)

Those dimensions for which attributes are to be assigned must have their names also assigned, and all prior dimensions must also be named, e.g.

XName="name of the 1st dimension" (16 character limit),
XUnits="units of the 1st dimension" (40 character limit)

A substitute for the defined dimension name and units can be specified for use on the display:

xname="substitute name of the 1st dimension" (16 character limit),
xunits="substitute units description of the 1st dimension" (40 character limit)

The order of dimensions can be assigned even when the variable is to be computed. If they are not assigned, the order is determined from the other variables by left-to-right examination of their dimensions.

The data can be wrapped around by specifying wrap indices, **XKwrap(k1,k2)**, and a cycle value **XCycle(C)**, so that a dimension then has values

X = x(i) + k*C (for all k=k1 to k2 and i = i1 to i2 for each k)

where **x(i1)=XFirst**, and **x(i2)=XLast**. For example, longitude can be wrapped negatively by 360 degrees and positively by 360 degrees with:

k1=-1 and k2=1 and C=360.

The range of values actually requested then can be defined within this larger range. The requested range is specified by **Xfirst** and **Xlast** below:

XKwrap=(first wrap index value,last wrap index value),
XCycle=wrap-around cycle,
XFirst=first value of wrap range,
XLast=last value of wrap range

The defined values, bounds, and weights can be assigned:

XValue: values of the first dimension nodes
XBound: values of the first dimension node boundaries
XWeight: weights to be used in computing weighted averages

These will be overridden by actual values computed, however. If a file name is specified, the bounds and weights will be sought from the same data file and, if not found, will be computed. After the bounds are determined, the weights are computed as the difference between bounds for each node, or as the difference between the sine of the bounds if the dimension is named **latitude**. If a **Function** is assigned, these values are taken from the first variable in the equation and as many subsequent variables as are necessary to fill all dimensions.

Every nth value of a dimension, beginning with **xfirst**, can be selected by specifying

xjump=n

By default, **xjump=1**.

The actual range of values chosen from a dimension (wrapped or not) is specified by **xfirst** and **xlast**, which also implies the direction of the dimension. However, if a grid transformation is specified by assigning a list of values for **xvalue**, then **xfirst** and **xlast** are given the first and last values of the list:

xfirst=first value of the selected range,
xlast= last value of the selected range

Values, bounds, and weights of the actual dimensions are determined from the defined values, or are computed, or are assigned as named lists, or as values. If assigned values do not coincide with actual nodes, then a grid transformation for the dimension is performed.

xvalue=list of values or actual values of the dimension nodes,
xbound=list of values or actual values of the node bounds,
xweight=list of values or actual values of the weights for each node

*Note, because the dimensions **Y**, **Z**, and **T** each have the same attributes as dimension **X**, the same assignments as for **Xname** to **xweight** above apply, except that **Y (y)**, **Z (z)**, or **T(t)** are substituted for **X (x)**.*

). End of the array data attributes.

Example Script

An example of an array data script follows:

A_psl(

File="/home/williams/example.nc",

Source="ECMWF ECMWFcycle 36 T42L19 AMIP 10 Year Simulation (1979-1988)",

Name="psl",

Title="Monthly Mean Sea Level Pressure",

Units="hPa",

XName="longitude",

YName="latitude",

ZName="time",

xjump=8,

yjump=8,

yfirst=-90.,

ylast=90.

)

VCS Scripts: Scripting Picture Template Attributes: P_name

Description

Picture Template attributes describe where and how segments of a picture will be displayed. The segments are graphical representations of:

textual identification of the data

formatted values of single-valued dimensions and mean, maximum, and minimum data values
axes, tick marks, and labels
boxes and lines
a legend that is graphics-method specific
the data.
Picture templates describe how to display all segments except the data and the legend.

Portrait vs Landscape Orientation

Picture templates allow the user to design the display of data in either a portrait or a landscape orientation of the VCS Canvas. Usually a template designed for one orientation does not work well with the other. Therefore, if both orientations are commonly used, it is necessary to name the templates so as to indicate the orientation. In the initialization script file, the prefix por is used to indicate that the template is intended for portrait orientation; all other prefixes implicitly designate a landscape orientation.

Normalized Device Coordinate Space

All positions in these attributes are specified in a normalized device coordinate (ndc) space, where the largest dimension of the space is 1.0, and the smallest is approximately 0.0.

Segment and Priority

It is not necessary to provide any Picture Template attributes for those segments that are not to be displayed; however, the user also has the option to fill in the attributes, but to turn off the segment display. A segment will not be displayed if its priority (p) is 0, or if a position coordinate is outside the closed region 1 < (x or y) < 0.

The total priority p is derived as follows from the segment priority and the picture priority:

p = (picture priority + segment priority)/1000.

where a value of p greater than 1 is set to 1.

Assignments

The Picture Template attributes define subsets of attributes that are used to specify the position or space and, for most segments, to graphically represent each segment of a picture as described below. The statement

P_name(

is used to define a table entry, or to change some or all of the attributes in an existing table entry. The possible assignments are described below by type.

*****Text*****

The following attribute subsets describe where and how to display the array data attributes that contain textual information. Names of the attribute subsets are the same as those used for the corresponding array data attributes.

File (p=priority,
x=x normalized device coordinate (ndc) of reference for text,
y=y ndc of reference for text,
Tt=text attributes name,
To=text orientation attribute set name),
Function (same as in array data attributes),
LogicalMask (same as in array data attributes),
Transform (same as in array data attributes),
source (same as in array data attributes),
name (same as in array data attributes),

title (same as in array data attributes),
units (same as in array data attributes),
crdate (same as in array data attributes),
crtime (same as in array data attributes),
comment#1 (same as in array data attributes),
comment#2 (same as in array data attributes),
comment#3 (same as in array data attributes),
comment#4 (same as in array data attributes),
xname (same as in array data attributes),
xunits (same as in array data attributes),
yname (same as in array data attributes),
yunits (same as in array data attributes),
zname (same as in array data attributes),
zunits (same as in array data attributes),
tname (same as in array data attributes),
tunits (same as in array data attributes),

****Formats****

The following attribute subsets describe how to format into text floating point values for single-valued dimensions and for the mean, maximum, and minimum of the array data, as well as where and how to display that text. Although attributes can be assigned to all dimensions, only those that are *single-valued* will be displayed in the manner described here.

xvalue (p=priority,
x=x ndc of reference for text,
y=y ndc of reference for text,
Th=format attribute set name,
Tt=text attribute set name,
To=text orientation attribute set name),
yvalue (same as xvalue above),
zvalue (same as xvalue above),
tvalue (same as xvalue above),
mean (same as xvalue above),
max (same as xvalue above),
min (same as xvalue above),

****Tick Marks****

The following attribute subsets describe where and how to display tick marks. Only one coordinate is given for the end points of tick marks because the placement of the other coordinate is determined by the graphics method attributes that define tick marks with lists of real-world coordinate values and strings.

xtic#1 (p=priority,
y1=y ndc for first point on the tick mark,
y2=y ndc for second point on the tick mark,
Tl=line attribute set name)
xtic#2 (same as xtic#1 above)
xmintic#a (same as xtic#1 above)
xmintic#b (same as xtic#1 above)
ytic#1 (p=priority,
x1=x ndc for first point on the tick mark,
x2=x ndc for second point on the tick mark,
Tl=line attribute set name)

ytic#2 (same as ytic#1 above)
ymintic#a (same as ytic#1 above)
ymintic#b (same as ytic#1 above)

*******Labels*******

The following attribute subsets describe where and how to display the axis labels. Only one coordinate of the reference points is given because the placement of the other coordinate is determined by the graphics method attributes that define labels with lists of real-world coordinate values and strings.

xlabel#1 (p=priority,
y=y ndc of reference for text,
Tt=text attribute set name,
To=text orientation attribute set name)
xlabel#2 (same as xlabel#1 above)
ylabel#1 (p=priority,
x=x ndc of reference for text,
Tt=text attribute set name,
To=text orientation attribute set name)
ylabel#2 (same as ylabel#1 above)

*******Boxes*******

The following attribute subsets describe where and how to draw boxes for the picture:

box#1 (p=priority,
x1=x ndc of first corner of the rectangular box,
y1=y ndc of first corner of the rectangular box,
x2=x ndc of second corner of the rectangular box,
y2=y ndc of second corner of the rectangular box,
Tl=line attribute set name)
box#2 (same as box#1 above)
box#3 (same as box#1 above)
box#4 (same as box#1 above)

*******Lines*******

The following attribute subsets describe where and how to draw lines for the picture:

line#1 (p=priority,
x1=x ndc of first point of the line,
y1=y ndc of first point of the line,
x2=x ndc of second point of the line,
y2=y ncd of second point of the line,
Tl=line attribute set name)
line #2 (same as line#1 above)
line #3 (same as line#1 above)
line #4 (same as line#1 above)

*******Legend*******

The following attribute subsets describe a rectangular space and text and line attributes to use for drawing a legend for the parameters of the graphics method:

legend (p=priority,
x1=x ndc of the first corner of the rectangular space,
y1=y ndc of the first corner of the rectangular space,
x2=x ndc of the next corner of the rectangular space,
y2=y ndc of the next corner of the rectangular space,
Tt=text attribute set name,
To=text orientation attribute set name,
Tl=line attribute set name)

*******Data*******

The following attribute subset describes the space for graphically displaying the array data. The graphics method will determine how it is displayed.

data (p=priority,
x1=x ndc of the first corner of the rectangular space,
y1=y ndc of the first corner of the rectangular space,
x2=x ndc of the next corner of the rectangular space,
y2=y ndc of the next corner of the rectangular space)

). End of the Picture Template attributes.

Script Example

An example of a Picture Template script follows:

```
P_AMIP(
    File(p=1,x=0.07,y=0.01,Tt=default,To=default),
    Function(p=1,x=0.07,y=0.01,Tt=default,To=default),
    LogicalMask(p=1,x=0.07,y=0.02,Tt=default,To=default),
    Transform(p=1,x=0.07,y=0.03,Tt=default,To=default),
    source(p=1,x=0.07,y=0.735,Tt=default,To=default),
    name(p=1,x=0.07,y=0.72,Tt=default,To=default),
    title(p=1,x=0.15,y=0.72,Tt=default,To=default),
    units(p=1,x=0.75,y=0.72,Tt=default,To=default),
    crdate(p=1,x=0.75,y=0.01,Tt=default,To=default),
    crtime(p=1,x=0.85,y=0.01,Tt=default,To=default),
    comment#1(p=1,x=0.1,y=0.72,Tt=default,To=default),
    comment#2(p=1,x=0.1,y=0.73,Tt=default,To=default),
    comment#3(p=1,x=0.1,y=0.74,Tt=default,To=default),
    comment#4(p=1,x=0.1,y=0.75,Tt=default,To=default),
    xname(p=0,x=0.5,y=0.21,Tt=default,To=defcenter),
    yname(p=0,x=0.02,y=0.4,Tt=default,To=defcentup),
    zname(p=0,x=0,y=0.82,Tt=default,To=default),
    tname(p=0,x=0,y=0.82,Tt=default,To=default),
```

xunits(p=0,x=0.6,y=0.21,Tt=default,To=default),

yunits(p=0,x=0.02,y=0.5,Tt=default,To=defcentup),

zunits(p=0,x=0,y=0.82,Tt=default,To=default),

tunits(p=0,x=0,y=0.82,Tt=default,To=default),

xvalue(p=1,x=0.47,y=0.705,Th=AMIP,Tt=default,To=default),

yvalue(p=1,x=0.67,y=0.705,Th=AMIP,Tt=default,To=default),

zvalue(p=1,x=0.07,y=0.705,Th=AMIP,Tt=default,To=default),

tvalue(p=1,x=0.27,y=0.705,Th=AMIP,Tt=default,To=default),

mean(p=1,x=0.07,y=0.68,Th=AMIP,Tt=default,To=default),

max(p=1,x=0.27,y=0.68,Th=AMIP,Tt=default,To=default),

min(p=1,x=0.47,y=0.68,Th=AMIP,Tt=default,To=default),

xtic#1(p=1,y1=0.2,y2=0.19,Tl=default),

xtic#2(p=1,y1=0.65,y2=0.66,Tl=default),

xmintic#a(p=1,y1=0.2,y2=0.195,Tl=default),

xmintic#b(p=1,y1=0.65,y2=0.655,Tl=default),

ytic#1(p=1,x1=0.07,x2=0.06,Tl=default),

ytic#2(p=1,x1=0.97,x2=0.98,Tl=default),

ymintic#a(p=1,x1=0.07,x2=0.065,Tl=default),

ymintic#b(p=1,x1=0.97,x2=0.975,Tl=default),

xlabel#1(p=1,y=0.183,Tt=default,To=defcenter),

xlabel#2(p=0,y=0,Tt=default,To=defcenter),

ylabel#1(p=1,x=0.055,Tt=default,To=defright),

ylabel#2(p=0,x=0,Tt=default,To=default),

box#1(p=1,x1=0.07,y1=0.2,x2=0.97,y2=0.65,Tl=default),

box#2(p=0,x1=0,y1=0.23,x2=0.92,y2=0.67,Tl=default),

box#3(p=0,x1=0,y1=0.24,x2=0.91,y2=0.66,Tl=default),

box#4(p=0,x1=0,y1=0,x2=0,y2=0,Tl=default),

line#1(p=0,x1=0.07,y1=0.425,x2=0.97,y2=0.425,Tl=default),

line#2(p=0,x1=0.5,y1=0.2,x2=0.5,y2=0.65,Tl=default),

line#3(p=0,x1=0,y1=0.4,x2=0.9,y2=0.4,Tl=default),

line#4(p=0,x1=0,y1=0.8,x2=0.9,y2=0.8,Tl=default),

legend(p=1,x1=0.07,y1=0.1,x2=0.97,y2=0.12,Tt=default,To=defcenter,Tl=default),

data(p=1,x1=0.07,y1=0.2,x2=0.97,y2=0.65)

)

*VCS Scripts: Scripting Graphics Attributes: G*_name*

Description

Graphics attributes define the projection and real-world coordinates of the space for the graphical representation of the data. They define axis labels and their positions, as well as tick mark positions in the real-world coordinate space of the data. Graphics attributes also describe the parameters required for the chosen graphics method, which determine the number of arrays and the number of multiple-valued dimensions required for each array.

Assignments

Many different graphics methods are available in VCS (e.g., Boxfill,Isofill, Isoline, Outfill, Scatter, Vector, etc.). *However, the documentation below shows how to modify only those attributes that are common to all the graphics methods. The scripts for the graphics attributes of particular graphics methods are described in sections specific to each method.*

The statement

G*_name(

is used to define a graphics table entry, or to change some or all of the attributes in an existing table entry. Possible attribute assignments are described below.

There are currently four different mapping projections implemented in VCS: 'linear' (the default), 'mollweide', 'robinson', and 'polar' (see Step 3 of the Example on Modifying Common Graphics Methods Attributes):

project = projection name (e.g., **'linear', 'mollweide', 'robinson', 'polar'**)

The labels and tick marks are defined by lists, which are specified by a list name. Each list value defines a position with respect to the real-world dimension coordinates and a string for display. Each named assignment defines tick positions, and those names that include the string **'ticlabels'** also define label strings and positions. For example, the named assignment **xticlabels#1='lat20'** defines a position (in degrees latitude) for each tick and label, as well as a string for each label:

xticlabels#1 = a prefixed list name for x-axis labels and ticks,

xticlabels#2 = another prefixed list name for x-axis labels and ticks,

xmtics#1 = a prefixed list name for x-axis minor ticks,

xmtics#2 = another prefixed list name for x-axis minor ticks,

yticlabels#1 = a prefixed list name for y-axis labels and ticks,

yticlabels#2 = another prefixed list name for y-axis labels and ticks,

ymtics#1 = a prefixed list name for y-axis minor ticks,

ymtics#2 = another prefixed list name for y-axis minor ticks,

The data space defined in the picture template, expressed in normalized device coordinates, is mapped to the real-world coordinates given in **datawc**:

datawc = (x1, y1, x2, y2),

xaxisconvert=conversion string (e.g., **'linear', 'log10', 'ln', 'exp', 'area_wt'**),

yaxisconvert=conversion string (e.g., **'linear'**, **'log10'**, **'ln'**, **'exp'**, **'area_wt'**--see the Example on Changing X- and/or Y-Axis Representation for further information on the conversion strings)

.
.
.

). End of the common graphics method attributes.

VCS Scripts: Scripting Boxfill Attributes: Gfb_name

Description

The Boxfill graphic method displays a two-dimensional data array by surrounding each data value with a colored grid box. For more information on the attributes that are common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

Gfb_name(

common graphics attributes,

.
.
.

specific graphics attributes

)

is used to define an Boxfill table entry, or to change some or all of the attributes in an existing Boxfill table entry.

The attributes specific to the Boxfill graphics method are as follows:

level_1 = the minimum data value

level_2 = the maximum data value

(If level_1 and level_2 are set to '1e+20', VCS will select the levels.)

color_1 = the minimun color range index

color_2 = the maximun color range index

Note, the *colormap ranges from 0 to 255, but only color indices 0 through 239 can be changed.*

To specify generation of a legend, given legend type:

legend_type = 0 *(for 'Legend VCS': VCS generates the legend values)*

legend_type = 1 *(for 'Legend Pts': must specify the interval, start, and end values of the legend)*

legend_type = 2 *(for 'Legend List': must supply a list of legend values)*

See Hints on the Boxfill Editor Panel and the Example on Modifying Boxfill Attributes for further information on legend types.

To specify legend values:

legend = () (if **legend_type = 0**, then no values are needed since VCS will generate them)

legend = (5,-40,35) (if **legend_type = 1**, then the legend interval = **5**, the legend start= **-40**, and the legend end = **35**)

legend = (legend_points) (**if legend_type = 1**, then **legend_points** is a List attribute set containing interval, start, and end values)

legend = (-40,-35,0,25,35) (**if legend_type = 2**, then the list **-40,-35,0,25,35** specifies the legend values)

legend = (legend_list) (if **legend_type = 2**, then **legend_list** is a List attribute set containing legend values)

To specify whether to display the underflow values on the plot:

ext_1 = 'y' (for yes) or **'n'** (for no)

ext_2 = 'y' (for yes) or **'n'** (for no)

To specify the color index for missing values:

missing = color index for missing values

Script Example

An example of a Boxfill graphics method script follows:

```
Gfb_example(
    projection=linear,
    xticlabels#1=*,
    yticlabels#1=*,
    datawc(1e+20,1e+20,1e+20,1e+20),
    level_1=1e+20,
    level_2=1e+20,
    color_1=16,
    color_2=239,
    Legend_type=2,
    Legend=(-42,-24,-6,12,30),
    ext_1=n,
    ext_2=n,
    missing=241
    )
```

VCS Scripts: Scripting Continents Attributes: Gcon_name

Description

The primary purpose of the Continents graphics method is to display a predefined, generic set of continental outlines in a longitude x latitude space. (However, no check is made to verify that the space dimensions are, in fact, longitude and latitude.) For more information on the attributes that are common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

```
Gcon_name(
    common graphics attributes,
    .
    .
    .
```

specific graphics attributes

)

is used to define a Continents table entry, or to change some or all of the attributes in an existing Continents table entry.

The attribute specific to the Continents graphics method is as follows:

Tl=line attribute set name

Script Example

An example of a Continents graphics method script follows:

Gcon_example(

projection=linear,

xticlabels#1=lon30,

xticlabels#2=lon30,

yticlabels#1=lat20,

yticlabels#2=lat20,

datawc(-180,-90,180,90),

Tl=std

)

VCS Scripts: Scripting Isofill Attributes: Gfi_name

Description

The Isofill graphics method fills the area between selected isolevels (levels of constant value) of a two-dimensional array; the manner of filling the area is determined by the named fill area attributes. For more information on the attributes that are common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

Gfi_name(

common graphics attributes,
.
.
.

specific graphics attributes

)

is used to define an Isofill table entry, or to change some or all of the attributes in an existing Isofill table entry.

The attributes specific to the Isofill graphics method are as follows:

range (id=unique integer identifier,

level1=the first bounding level,

level2=the second bounding level,

Tf=fill area attribute set name

)

Attributes defined in the parentheses above may be repeated as many times as needed.

If no range attributes are specified, then the levels will be determined, and the fill area attribute sets will begin, with the name ‘def 37’ or ‘default’. As many levels as needed will be used, in sequence, or those that exist will be repeatedly used until all ranges have a fill area name. Otherwise, the bounding isolevels and the type of fill area to be used are defined by the sets of range attributes shown above.

Script Example

An example of an Isofill graphics method script follows:

```
Gfi_example(
projection=linear,
xticlabels#1=lon30,
xticlabels#2=lon30,
xmtics#1=lon5,
xmtics#2=lon5,
yticlabels#1=lat20,
yticlabels#2=lat20,
ymtics#1=lat5,
ymtics#2=lat5,
datawc(-180,-90,180,90),
range
(id=1,level1=-1e+20,level2=970,Tf=AMIP30)
(id=2,level1=970,level2=975,Tf=AMIP29)
(id=3,level1=975,level2=980,Tf=AMIP28)
(id=4,level1=980,level2=985,Tf=AMIP27)
(id=5,level1=985,level2=990,Tf=AMIP26)
(id=6,level1=990,level2=995,Tf=AMIP25)
(id=7,level1=995,level2=1000,Tf=AMIP24)
(id=8,level1=1000,level2=1005,Tf=AMIP23)
(id=9,level1=1005,level2=1010,Tf=AMIP22)
(id=10,level1=1010,level2=1015,Tf=AMIP21)
(id=11,level1=1015,level2=1020,Tf=AMIP20)
(id=12,level1=1020,level2=1025,Tf=AMIP19)
(id=13,level1=1025,level2=1030,Tf=AMIP18)
(id=14,level1=1030,level2=1035,Tf=AMIP17)
```

(id=15,level1=1035,level2=1040,Tf=AMIP35)

(id=16,level1=1040,level2=1e+20,Tf=AMIP36)

)

VCS Scripts: Scripting Isoline Attributes: Gi_name

Description

The Isoline graphics method draws lines of constant value at specified levels to graphically represent the values of a two-dimensional array; labels also can be displayed on the isolines. For more information on the attributes that are common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

Gi_name(

common graphics attributes,

.

.

.

specific graphics attributes

)

is used to define an Isoline graphics table entry , or to change some or all of the attributes in an existing Isoline table entry.

The attributes specific to the Isoline graphics method are as follows:

Isolines are labeled or not according to the setting of the switch

make_labels = 'y' (for yes) or **'n'** (for no)

The appearance of the isolines is determined by the named line attribute set (**Tl**), and the text for labels is determined by the named (**Tt**) text and (**To**) text orientation attribute sets . If no line attributes are assigned, then an interval will be determined with a starting level at 0.0 and with **'default'** attributes for **Tl**, **Tt**, and **To**. Otherwise, isolines are defined by the subset of attributes shown below.

Isolines are drawn at the levels defined by (**level** + **k*increment**), for all integers **k** greater than or equal to 0 (see attributes below). When isoline levels are multiply defined, the last definition takes precedence *unless a higher priority is specified for an earlier definition*.

As a default, the actual level of each isoline will appear as the label. A single text string can be specified for labeling all isolines defined by a set of line attributes. If an asterisk (*****) is specified instead, the text representation of each isoline value will be displayed. A background for each isoline label is highlighted with the color indicated by **hilite_ci** (see attributes below).

lines (id = unique integer identifier,

priority = integer value (see Scripting Picture Template Attributes: P_name),

level = the starting level,

increment = increment between successive levels,

hilite_ci = color index for highlighting labels,

label = text for a label or * to obtain the actual level on each isoline,

Tl = line attribute set name,

Tt = text attribute set name,

To = text orientation attribute set name

)

Attributes in parentheses above may be repeated as many times as needed.

Script Example

An example of an Isoline graphics method script follows:

```
Gi_example(
    projection=linear,
    xticlabels#1=lon30,
    xticlabels#2=lon30,
    xmtics#1=lon5,
    xmtics#2=lon5,
    yticlabels#1=lat20,
    yticlabels#2=lat20,
    ymtics#1=lat5,
    ymtics#2=lat5,
    datawc(-180,-90,180,90),
    make_labels=n,
    lines(
            id=0,
            priority=0,
            level=0,
            increment=1e+20,
            hilite_ci=0,
            label=*,
            Tl=default,
            Tt=default,
            To=default
            )
```

VCS Scripts: Scripting Outfill Attributes: Gfo_name

Description

The primary purpose of the Outfill graphics method is to display filled continents or sea ice using a surface type array that indicates land, ocean, and sea ice points. In general, however, this graphics method can be used to fill a set

of integer values for any array. For more information on the attributes that are common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

Gfo_name(

common graphics attributes,

.

.

.

specific graphics attributes

)

is used to define an Outfill table entry, or to change some or all of the attributes in an existing Outfill table entry. Attributes specific to the Outfill graphics method are as follows.

Fill area attributes are defined by

Tf=fill area attribute set name

Outlines are filled to enclose the selected values that appear in the data array. As few as one, or as many as ten values, can be specified:

outline=([n1,[n2,[n3,...[n10]...]]])

Script Example

An example of an Outfill graphics method script follows:

Gfo_example(

projection=linear,

xticlabels#1=*,

xticlabels#2=*,

yticlabels#1=*,

yticlabels#2=*,

datawc(1e+20,1e+20,1e+20,1e+20),

xaxisconvert=linear,

yaxisconvert=linear,

Tf=AMIP20,

outline(1)

)

VCS Scripts: Scripting Outline Attributes: Go_name

Description

The primary purpose of the Outline graphics method is to display outlined continents or sea ice using a surface type

array that indicates land, ocean, and sea ice points. In general, however, this graphics method can be used to outline a set of integer values for any array. For more information on the attributes that are common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

Go_name(

common graphics attributes,

.

.

.

specific graphics attributes

)

is used to define an Outline table entry , or to change some or all of the attributes in an existing Outline table entry.

Attributes specific to the Outline graphics method are as follows:

Tl=line attribute set name

Outlines are drawn to enclose the specified values in the data array. As few as one or as many as ten values can be specified:

outline=([n1,[n2,[n3,...[n10]...]]])

Script Example

An example of an Outline graphics method script follows:

Go_example(

projection=linear,

projection=linear,

xticlabels#1=*,

xticlabels#2=*,

yticlabels#1=*,

yticlabels#2=*,

datawc(1e+20,1e+20,1e+20,1e+20),

xaxisconvert=linear,

yaxisconvert=linear,

Tl=std,

outline(1)

)

VCS Scripts: Scripting Scatter Attributes: GSp_name

Description

The Scatter graphics method displays a a scatter plot of two data arrays A(x, y, z, t) and B(x, y, z, t). For more information on the attributes that are common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

GSp_name(

common graphics attributes,

.

.

.

specific graphics attributes

)

is used to define an Scatter table entry, or to change some or all of the attributes in an existing Scatter table entry.

The attribute specific to the Scatter graphics method pertains to the type of marker to be used:

Tm = marker attribute set name

Script Example

An example of a a Scatter graphics method script follows:

```
GSp_example(
    projection=linear,
    xticlabels#1=*,
    xticlabels#2=*,
    yticlabels#1=*,
    yticlabels#2=*,
    datawc(1e+20,1e+20,1e+20,1e+20),
    xaxisconvert=linear,
    yaxisconvert=linear,
    Tm=red
    )
```

VCS Scripts: Scripting Vector Attributes: Gv_name

Description

The Vector graphics method displays a vector plot of a 2D vector field. Vectors are located at the coordinate

locations and point in the direction of the data vector field. Vector magnitudes are the product of data vector field lengths and a scaling factor. For more information on the attributes that are common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

Gv_name(

common graphics attributes,

.

.

.

specific graphics attributes

)

is used to define an Vector table entry, or to change some or all of the attributes in an existing Vector table entry.

The attributes specific to the Vector graphics method are as follows:

Tl = line attribute set name

vector_scale = vector scale value

vector_align = desired alignment (e.g.,'t'=tail, 'c'=center, 'h'=head)

vector_type = desired vector type (e.g., 1=arrow, 2=solid arrow, 3=wind barb)

ref_vector = n, where n defines the size of the vector (a value of '1.e+20' cues VCS to select an appropriately sized reference vector)

Script Example

An example of a Vector graphics method script follows:

Gv_example(

projection=linear,

xticlabels#1=*,

xticlabels#2=*,

yticlabels#1=*,

yticlabels#2=*,

datawc(1e+20,1e+20,1e+20,1e+20),

xaxisconvert=linear,

yaxisconvert=linear,

Tl=default,

vector_scale=1,

vector_align=c,

vector_type=2,

ref_vector=1e+20

)

VCS Scripts: Scripting XvsY Attributes: GXY_name

Description

The XvsY graphics method displays a line plot from a 1D data array, that is X(y), where y represents the 1D coordinate values. For more information on the attributes common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

GXY_name(

common graphics attributes,.

.

.

.

specific graphics attributes

)

is used to define an XvsY table entry, or to change some or all of the attributes in an existing XvsY table entry.

The attributes specific to the XvsY graphics method are as follows:

Tl=line attribute set name

Tm=marker attribute set name

Script Example

An example of an XvsY graphics method script follows:

GXY_example(

projection=linear,

xticlabels#1=*,

xticlabels#2=*,

yticlabels#1=*,

yticlabels#2=*,

datawc(1e+20,1e+20,1e+20,1e+20),

xaxisconvert=linear,

yaxisconvert=linear,

Tl=default,

Tm=default

)

VCS Scripts: Scripting Xyvsy Attributes: GXy_name

Description

The Xyvsy graphics method displays a line plot from a 1D data array, that is X(y), where y represents the 1D coordinate values. For more information on the attributes common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

GXy_name(

common graphics attributes,

.

.

.

specific graphics attributes

)

can be used to define a Xyvsy table entry, or to change some or all of the attributes in an existing Xyvsy table entry.

The attributes specific to the Xyvsy graphics method are as follows:

Tl=line attribute set name

Tm=marker attribute set name

Script Example

An example of an Xyvsy graphics method script follows:

GXy_example(

projection=linear,

xticlabels#1=*,

xticlabels#2=*,

yticlabels#1=*,

yticlabels#2=*,

datawc(1e+20,1e+20,1e+20,1e+20),

xaxisconvert=linear,

yaxisconvert=linear,

Tl=default,

Tm=default

)

VCS Scripts: Scripting Yxvsx Attributes: GYx_name

Description

The Yxvsx graphics method displays a line plot from a 1D data array, that is Y(x) where x represents the 1D coordinate values. For more information on the attributes common to all the graphics methods, see Scripting Graphics Attributes: G*_name.

Assignments

The statement

GYx_name(

common graphics attributes,

.

.

.

specific graphics attributes

)

can be used to define a Yxvsx table entry, or to change some or all of the attributes in an existing Yxvsx table entry.

The attributes specific to the Yxvsx graphics method are as follows:

Tl=line attribute set name

Tm=marker attribute set name

Script Example

An example of a Yxvsx graphics method script follows:

```
GYx_example(
    projection=linear,
    xticlabels#1=*,
    xticlabels#2=*,
    yticlabels#1=*,
    yticlabels#2=*,
    datawc(1e+20,1e+20,1e+20,1e+20),
    xaxisconvert=linear,
    yaxisconvert=linear,
    Tl=default,
    Tm=default
    )
```

VCS Scripts: Scripting Secondary Element Attribute Sets

The secondary elements are used to define attributes of the primary elements, which consist of the data, picture template, and graphics method.

There are eight secondary elements:

- colormap: specification of combinations of 256 available colors
- fill area: style, style index, and color index
- format: specification for converting numbers to display strings
- line: line type, width and color index
- list: a sequence of pairs of numerical and character values
- marker: marker type, size, and color index
- text: text font type, character spacing, expansion and color index
- text orientation: character height, angle, path, and horizontal/vertical alignment

The secondary elements are assigned in the same manner as the primary elements, except that there are no attribute names; therefore, the secondary element attributes are necessarily fixed, and all values must be given.

VCS Scripts: Scripting Colormap Attributes: C_name

Description

A colormap contains 240 user-definable colors that are used for graphical displays. The color mixtures are defined in terms of percentages of red, green, and blue colors (0 to 100% for each). The resulting color depends on the specified mixtures of red, green, and blue.

There are 16 additional colors that are usable, but they cannot be changed by the user. These fixed colors are, in order: 240-white, 241-black, 242-red, 243-green, 244-blue, 245-yellow, 246-cyan, 247-magenta, 248-orange, 249-brown, 250-violet, 251-olive green, 252-grey, 253-light green, 254-light red, and 255-light blue. In addition, colors 0 through 4 are used for VCS interactive windows and panels.

Assignments

The Colormap attributes are specified as follows:

C_name(red,green,blue, ...)

where:

red=red color index value
green=green color index value
blue=blue color index value

*******red = red color index value *******

The red color index value ranges from 0 to 100.

*******green = green color index value *******

The green color index value ranges from 0 to 100.

*******blue = blue color index value *******

The blue color index value ranges from 0 to 100.

Script Example

An example of a Colormap script follows:

C_AMIP(100,100,100, 0,0,0, 44.7,62.4,100, 29.8,44.3,62, 76.9,84.3,100, 100,100,0, 100,55.6863,16.4706, 0,0,0, 100,100,100, 0,0,0, 100,0,0, 0,100,0, 0,0,100, 100,100,0, 0,100,100, 100,0,100, 98.4314,98.4314,100, 78.4314,12.549,3.1373, 88.6274,20,5.4902, 94.5098,33.3333,12.549, 100,55.6863,16.4706, 99.6078,80,24.7059, 97.6471,87.8431,24.7059, 95.6863,100,24.3137, 79.2157,100,83.5294, 52.549,100,94.5098, 36.4706,100,94.5098, 7.0588,78.4314,100, 23.5294,52.9412,100, 57.6471,20.7843,99.6078, 84.7059,6.6667,99.6078, 100,0,100, 80.7843,100,15.6863, 44.3137,100,14.1176, 23.1373,85.098,56.8627, 65.8824,0,0, 47.451,8.2353,11.3725, 0,50,100, 0,40,100, 0,30,100, 0,20,100, 0,10,100, 0,0,100, 10,0,100, 20,0,100, 30,0,100, 40,0,100, 50,0,100, 60,0,100, 70,0,100, 80,0,100, 90,0,100, 100,0,100, 100,0,90, 100,0,80, 100,0,70, 100,0,60, 100,0,50, 100,0,40, 100,0,30, 100,0,20, 100,0,10, 100,0,0, 95,10,10, 90,20,20, 85,30,30, 80,40,40, 75,50,50, 70,60,60, 65,70,70, 60,80,80, 55,90,90, 50,100,100, 45,100,90, 40,100,80, 35,100,70, 30,100,60, 25,100,50, 20,100,40, 15,100,30, 10,100,20, 5,100,10, 0,100,0, 10,95,10, 20,90,20, 30,85,30, 40,80,40, 50,75,50, 60,70,60, 70,65,70, 80,60,80, 90,55,90, 100,50,100, 90,45,100, 80,40,100, 70,35,100, 60,30,100, 50,25,100, 40,20,100, 30,15,100, 20,10,100, 10,5,100, 0,0,100, 10,10,95, 20,20,90, 30,30,85, 40,40,80, 50,50,75, 60,60,70, 70,70,65, 80,80,60, 90,90,55, 100,100,50, 100,90,45, 100,80,40, 100,70,35, 100,60,30, 100,50,25, 100,40,20, 100,30,15, 100,20,10, 100,10,5, 100,0,0, 95,0,0, 90,0,0, 85,0,0, 80,0,0, 75,0,0, 70,0,0, 65,0,0, 60,0,0, 55,0,0, 50,0,0, 45,0,0, 40,0,0, 35,0,0, 30,0,0, 25,0,0, 20,0,0, 15,0,0, 10,0,0, 5,0,0, 0,0,0, 0,5,0, 0,10,0, 0,15,0, 0,20,0, 0,25,0, 0,30,0, 0,35,0, 0,40,0, 0,45,0, 0,50,0, 0,55,0, 0,60,0, 0,65,0, 0,70,0, 0,75,0, 0,80,0, 0,85,0, 0,90,0, 0,95,0, 0,100,0, 0,95,5, 0,90,10, 0,85,15, 0,80,20, 0,75,25, 0,70,30, 0,65,35, 0,60,40, 0,55,45, 0,50,50, 0,45,55, 0,40,60, 0,35,65, 0,30,70, 0,25,75, 0,20,80, 0,15,85, 0,10,90, 0,5,95, 0,0,100, 0,0,95, 0,0,90, 0,0,85, 0,0,80, 0,0,75, 0,0,70, 0,0,65, 0,0,60, 0,0,55, 0,0,50, 0,0,45, 0,0,40, 0,0,35, 0,0,30, 0,0,25, 0,0,20, 0,0,15, 0,0,10, 0,0,5, 0,0,0, 5,5,5, 10,10,10, 15,15,15, 20,20,20, 25,25,25, 30,30,30, 35,35,35, 40,40,40, 45,45,45, 50,50,50, 55,55,55, 60,60,60, 65,65,65, 70,70,70, 75,75,75, 80,80,80, 85,85,85, 90,90,90, 95,95,95, 100,100,100, 100,95,95, 100,90,90, 100,85,85, 100,80,80, 100,75,75, 100,70,70, 100,65,65, 100,60,60, 100,55,55, 100,50,50, 100,45,45, 100,40,40, 100,35,35, 100,30,30, 100,25,25, 100,20,20, 100,15,15)

VCS Scripts: Scripting Fill Area Attributes: Tf_name

Description

The fill area attributes are used to display regions defined by closed polygons, which can be filled with a uniform color, a pattern, or a hatch style. Attributes specify the style, color, position, and dimensions of the fill area.

Assignments

The Fill Area attributes are specified as follows:

Tf_name(fais,fasi,faci,rx,ry,w,h)

where:

fais=fill area interior style
fasi=fill area style index
faci=fill area color index
rx=x coordinate of the pattern reference point
ry=y coordinate of the pattern reference point
w=pattern width
h=pattern height

*******fais = fill area interior style*******

The area is filled according to the fill area interior style (fais), index which must be one of the following:

1=solid
2=pattern
3=hatch

*****fasi = fill area style index*****

If hatch or pattern is specified for fais, then integer index fasi determines which of 20 different patterns or hatch styles are to be used. By default, fasi is set to 1.

*******faci = fill area color index*******

The faci color index applies only if solid or hatch is chosen for fais. In that case, faci is defined as an integer value in the color table, where colors are numbered 0 through 255. *Note, colors numbered 240 through 255 cannot be changed by the user, while colors 0 through 4 are used for VCS interactive windows and panels*.

*******rx,ry = x,y coordinate of the pattern reference point*******
*******w, h = pattern width and height*******

The reference point (**rx,ry**), width (**w**), and height (**h**) in normalized device coordinates (0 to 1) are used only if a fill area pattern is chosen. By default, **rx**=**ry** = 0 and **w**=**h** = 1.

Each pattern is divided into a regular grid of cells according to the dimensions width (**w**), and height (**h**) of the color index array. Each cell is assigned a color index from the color index array so that array fields **(1,1)**, **(1,h)**, **(w,1)**, and **(w,h)** correspond, respectively, to the upper left, lower left, upper right, and lower right corner of the pattern rectangle.

Script Example

An example of a Fill Area script follows:

Tf_example(

3,

-1,

241,

0,

0,

0.1,

0.1

)

VCS Scripts: Scripting Formats Attributes: Th_name

Description

The Format attribute set defines the name, units, and format of a dimension.

Assignments

The Format attributes are assigned as follows:

Th_name((name,units,format) (name,units,format)...)

A different format is assigned for each of a set of variables that are defined by name and units. The Format attributes are:

name=name of the variable that uses the format

units=units of the variable that uses the format

format=description of the format

*******name = name of the variable that uses the format*******

The variables that use formats are the single-valued dimensions of the array data, which require descriptors for the dimension name and units, and the mean (‘mean’), maximum (‘max’) , and minimum (‘min’) of the array data variable whose units are the same as those of the variable.

*******units = units of the variable that uses the format*******

A single Format attribute set can contain multiple formats that are selected by comparing the name and units of the variable to be formatted with those defined by the attributes. The formats are used to convert floating point numbers to a text form. The selection of units for time is especially rich (see below).

Note, the units attribute can be specified with an asterisk (*) to indicate that it has no effect on the format; that is, any variable with the specified (*) can use the format.

******* format = description of the format*******

Formats are character strings that can be up to 120 characters in length. (In VCS, character strings are denoted by use of double quotes "...") They may contain printing characters and blanks as well as:

%n to display the name of the variable

%u to display the units of the variable

%g to format the floating point value to a string of digits

%t[a:b:c] to format the floating point value using the bracketted descriptors

The name and units of the variable determine which of the formats to use. For example, the bracketted descriptors **[a:b:c]** above are designed to express time in various units. Available format descriptors include:

s=second

m=minute

h=hour

M=month number

y=last two digits of the year (e.g., 93)

c=full century and year designation (e.g., 1993)

mon=lower case, three-character month designation (e.g., jan)

Mon=capitalized, three-character month designation (e.g., Jan)

MON=upper case, three-character month designation (e.g., JAN)

S=upper case, three-character season designator (e.g., DJF)

Sea= capitalized, three-character month as a season designator (e.g., Dec-Jan-Feb)

SEA= uppercase, three-character month as a season designator (e.g., DEC-JAN-FEB)

season= lowercase, full-month season designator (e.g., december-january-february)

Season= capitalized, full-month season designator (e.g., December-January-February)

SEASON= uppercase, full month season designator (e.g., DECEMBER-JANUARY-FEBRUARY)

Script Example

An example of a Format script follows:

Th_example(

("time","month","%t[Mon/c+1979]")

("mean","*","%n %g"),

("max","*","%n %g")

("min","*","%n %g")

("month","*","%t[Mon/c+1979]")

)

VCS Scripts: Scripting Line Attributes: Tl_name

Description

Tl attributes specify the type, width, and color of the line to be drawn for a graphical display.

Assignments

Line attributes are specified as follows:

Tl_name(type,lwsf,ci)

where:

type=type of line
lwsf=line width scale factor
ci=color index

*******type = type of line *******

Defined line types include:

1=solid,
2=dashed,
3=dotted,
4=dot dashed

*******lwsf = line width scale factor *******

VCS multiplies the line width scale factor by 10 (e.g. **lwsf** = 2.0 implies a line width of 2.0 x 10 = 20.0), and the default **lwsf** is 1.0. (Some experimentation may be necessary to achieve the desired line width if a nondefault **lwsf** value is specified.)

*******ci = color index *******

The color index is an integer value (0 to 255) in the color table. *Note, colors numbered 240 through 255 cannot be changed by the user, while colors 0 through 4 are used for VCS interactive windows and panels.*

Script Example

An example of a Line script follows:

Tl_example(

1,

2,

242

)

VCS Scripts: Scripting List Attributes: L_name

Description

Lists consist of sequential pairs of (value, string) combinations, which can be referred to in their entirety or as a single indexed pair. The ability to refer to predefined lists in this manner offers a shorthand method for assigning sequences of values, or strings, or coincident pairs of both, and avoids the need to enter them at execution time.

Lists are useful for defining tick mark positions and for defining dimension labels and their positions (e.g. longitude values and labels). They provide a means of defining the node points for the dimensions of a new grid, which is necessary to request grid transformations.

Lists also are useful for defining many of the assignable attributes of array data; for example, indexed list assignments can be used to step through a dimension (such as time) by incrementing the index value. This provides a simple means for producing time-sequential raster image files to be used in an animation.

Assignments

List attributes are specified as follows:

L_name(value,'string',...)

where:

value=value of the string

string=string that represents the value

Script Example

An example of a List script follows:

L_lon5(-360,"0",-355,"5E",-350,"10E",-345,"15E",-340,"20E",-335,"25E", -330,"30E",-325,"35E",-320,"40E",-315,"45E",-310,"50E",-305,"55E", -300,"60E",-295,"65E",-290,"70E",-285,"75E",-280,"80E",-275,"85E", -270,"90E",-265,"95E",-260,"100E",-255,"105E",-250,"110E", -245,"115E",-240,"120E",-235,"125E",-230,"130E",-225,"135E", -220,"140E",-215,"145E",-210,"150E",-205,"155E",-200,"160E", -195,"165E",-190,"170E",-185,"175E",-180,"180",-175,"175W", -170,"170W",-165,"165W",-160,"160W",-155,"155W",-150,"150W", -145,"145W",-140,"140W",-135,"135W",-130,"130W",-125,"125W", -120,"120W",-115,"115W",-110,"110W",-105,"105W",-100,"100W", -95,"95W",-90,"90W",-85,"85W",-80,"80W",-75,"75W",-70,"70W", -65,"65W",-60,"60W",-55,"55W",-50,"50W",-45,"45W",-40,"40W", -35,"35W",-30,"30W",-25,"25W",-20,"20W",-15,"15W",-10,"10W", -5,"5W",0,"0",5,"5E",10,"10E",15,"15E",20,"20E",25,"25E",
30,"30E",35,"35E",40,"40E",45,"45E",50,"50E",55,"55E",60,"60E",
65,"65E",70,"70E",75,"75E",80,"80E",85,"85E",90,"90E",95,"95E",
100,"100E",105,"105E",110,"110E",115,"115E",120,"120E",125,"125E",
130,"130E",135,"135E",140,"140E",145,"145E",150,"150E",155,"155E",
160,"160E",165,"165E",170,"170E",175,"175E",180,"180",185,"175W",
190,"170W",195,"165W",200,"160W",205,"155W",210,"150W",215,"145W",
220,"140W",225,"135W",230,"130W",235,"125W",240,"120W",245,"115W",

250,"110W",255,"105W",260,"100W",265,"95W",270,"90W",275,"85W",
280,"80W",285,"75W",290,"70W",295,"65W",300,"60W",305,"55W",
310,"50W",315,"45W",320,"40W",325,"35W",330,"30W",335,"25W",
340,"20W",345,"15W",350,"10W",355,"5W",360,"0")

VCS Scripts: Scripting Marker Attributes: Tm_name

Description

If specific graphical symbols, symbol sizes, and colors are desired, the corresponding Tm marker attributes are assigned.

Assignments

Marker attributes are specified as follows:

Tm_name(type,size,ci)

where:

type=marker type
size=marker size scale factor
ci=color index

*******type = marker type*******

Defined marker types include:

1=dot,
2=plus,
3=asterisk,
4=circle,
5=cross,
6=diamond,
7=triangle_up,
8=triangle_down,
9=triangle_left,
10=triangle_right,
11=square,
12=diamond_fill,
13=triangle_up_fill,
14=triangle_down_fill,
15=triangle_left_fill,
16=triangle_right_fill,
17=none.

*******size = marker size scale factor*******

VCS multiplies the marker scale factor by 10 (e.g. size = 2.0 yields a marker size of 2.0 x 10 = 20.0), and the default value is 1.0. (Some experimentation may be required to achieve the desired appearance if a nondefault value of size is specified.)

*******ci = color index*******

The color index is an integer value (0 to 255) in the color table. *Note, colors numbered 240 through 255 cannot*

be changed by the user, while colors 0 through 4 are used for VCS interactive windows and panels.

Script Example

An example of a Marker script follows:

Tm_example(

1,

2,

242

)

VCS Scripts: Scripting Text Attributes: Tt_name

Description

Graphical displays often contain textual inscriptions which provide further information. The Text attributes allow the generation of character strings on the VCS Canvas by defining the character font, precision, expansion, spacing, and color.

Assignments

The Text attributes are specified as follows:

Tt_name(font,pr,cexp,csp,ci)

where:

font=character font index
pr=character precision index
cexp=horizontal character expansion factor
csp=character spacing
ci=color index

*******font = character font index*******

Font index numbers are XGKS-implementation-dependent. If the requested font number does not exist for the implementation, then font number 1 is used. All text within VCS is implemented through stroke fonts; thus, text primitives are fully transformable. The nine font styles supported by XGKS are:

- **Sanserif Roman**
- **Serif Roman**
- **Sanserif Bold Roman**
- **Serif Bold Roman**
- **Sanserif Italic Roman**
- **Serif Italic Roman**
- **Sanserif Script**
- **Serif Script**
- **Gothic**

*******pr = character precision index*******

Text can be displayed with increasing precision, from **character** (**pr** = 0) , to **string** (**pr** = 1), to **stroke** (**pr** = 3). The precision is both GKS-specific and font-specific, and has an effect on the manipulation and clipping of text. *Suggestion: either consult the GKS manual and experiment with fonts and precisions, or use **stroke** precision with each font.*

*******cexp = horizontal character expansion factor*******

Characters can be expanded in the horizontal direction by a character expansion factor that multiplies the width. The default value is **cexp = 1**.

*******csp = character spacing*******

Character spacing defines the space between characters, in normalized device coordinates. It can be changed from its default value of 0, to a negative value which overlaps characters, or to a positive value which increases the space between characters.

*******ci = color index*******

The color index is an integer value (0 to 255) in the color table. *Note, colors numbered 240 through 255 cannot be changed by the user, while colors 0 through 4 are used for VCS interactive windows and panels.*

Script Example

An example of a Text script follows:

Tt_example(

1,

1,

1,

0.2,

1

)

VCS Scripts: Scripting Text Orientation Attributes: To_name

Description

VCS provides a variety of Text Orientation attributes which control the positioning of the text on the VCS Canvas. The Text Orientation attributes allow the appearance of text character strings to be changed by defining the character height, up-angle, path, and horizontal and vertical alignment.

Note, both the Text and Text Orientation attributes are necessary to define the appearance of the text; by separating these two aspects, the number of predefined attribute sets required for a large variety of applications can be significantly reduced.

Assignments

The Text Orientation attributes are specified as follows:

To_name(chh,chua,chp,chhal,chval)

where:

chh=character height
chua=character up-angle

chp=character path
chhal=character horizontal alignment
chval=character vertical alignment

******chh=character height******

The character height is given in normalized device coordinates (a range of 0 to 1). A value of 0.01 is easily visible.

******chua = character up angle******

The character up-angle, which defines the text orientation with respect to the vertical, is measured positive clockwise from the vertical in units of degrees.

******chp = character path******

The character path is the direction in which the characters making up a string are to be read. The character path is specified as '**r**' if the characters are to be read from left to right, '**l**' if they are to be read from right to left, '**u**' if they are to be read in an upward direction, or '**d**' if they are to be read in a downward direction. The order of the displayed characters and the orientation of the character string are affected accordingly.

******chhal = character horizontal alignment******

The horizontal alignment defines the left-right position of the character within the space that surrounds the character (denoted as the "character space"). Horizontal alignment is specified as '**l**' for left-justified, '**r**' for right-justified, or '**c**' for centered.

******chval = character vertical alignment******

The vertical alignment defines the vertical position of text within the character space. It is specified as '**t**' for text alignment at the top of the character space, as '**c**' (for cap) for alignment at the top of the physical character, as '**h**' (for half) for alignment at the middle of the character, as '**b**' for alignment at the bottom of the physical character, or as '**B**' for alignment at the base of the character space.

Script Example

An example of a Text Orientation script follows:

Tt_example(

1,

1,

1,

0.2,

1

)

VCS Scripts: Scripting Display Attributes: D_name

Description

Every entry in the Display table is used to create a display page. A single Display table entry uses the primary elements (consisting of data, picture template, and graphics method) to create a picture, which is made up of segments.

Each picture is assigned a priority, where the picture with the highest value is displayed on top of all others. In addition, each picture segment has a separate priority. The total priority **p** is computed from

p = (picture priority + segment priority)/1000.

The range of priorities is between 0 and 1. If the value of **p** is greater than 1, it is set to 1.

The selected Array Data attribute set defines the data to be displayed as well as related descriptive information. The variables (or array data attributes) can either be selected from a file, or computed as a function of previously selected variables.

The selected Picture Template attribute set defines where and how to display all segments, except for the legend and the data.

The selected Graphics Method attribute set defines the legend and determines how the data will be graphically represented. There is a table of attribute sets for each valid graphics method name that can be referenced by type. For VCS, the valid graphics method names are: Boxfill, Continents, Isofill, Isoline, Outfill, Outline, Scatter, Vector, XvsY, Xyvsy, and Yxvsx.

Assignments

A Display table entry, defined by the assignment statement below, can be used to specify a table entry or to change some or all of the attributes in an existing table entry.

D_name(

priority=priority for the picture,

type=graphics method name,

off=true or false (1 or 0),

p_name=picture template attribute set name,

g_name=graphics attribute set name in the table defined by type,

The square brackets [ ] below indicate that the number of array data attribute sets can vary. The number required and their dimensionality are determined by the graphics method name.

[,a=first array data attribute set name

[, b=second array data attribute set name

[, c=third array data attribute set name

[, d=fourth array data attribute set name

[, e=fifth array data attribute set name

[, f=sixth array data attribute set name]]]]]

). End of the Display attributes.

Script Example

An example of a Display script follows:

D_display_0(

off=0

priority=0,

type=Vector,

template=default,

graph=example,

a=u,

b=v,

)

VCS Scripts: Script Commands

Script commands define the actions that are necessary to preserve an interactive session as a script and to mimic that session in a noninteractive replay of the script. The button, menu, and panel manipulation visuals do not appear during the replay, but the graphics, Postscript, and raster images are reproduced. *Note, VCS script commands are **not** case sensitive.*

VCS Scripts: Script Command: Canvas

Description

The VCS Canvas is either opened or closed on the graphics workstation according to the specification of the Canvas script command. However, nothing will happen if there is no logical attachment of a graphics device to the process. Also, when in interactive mode, this command will have no effect, since the VCS Canvas is already open and cannot be closed by the Canvas command.

Assignments

Canvas(status)

where status is either **open** or **close**.

Script Examples

Canvas status opened:

Canvas(open)

Canvas status closed:

Canvas(close)

VCS Scripts: Script Command: CGM

Description

The CGM command specifies the creation of a cgm file. If a file name is given with no path, then the

/$HOME/PCMDI_GRAPHICS

directory path will be prefixed to the file name. If neither is given, or if the path and file name matches a previously opened cgm file, then this will be used. If neither is given, and if no previous cgm file is open, then a file named

/$HOME/PCMDI_GRAPHICS/defaultxx.cgm

where *xx* is a two digit number will be used unless all 99 defaults already exist, in which case no cgm file will be written.

If the path and file name does not match the open cgm file name, then the latter will be closed, and an attempt will be made to open the new file. If the new file already exists, then a file named

/$HOME/PCMDI_GRAPHICS/defaultxx.cgm

will be opened instead (see above). If the new file does not exist, and therefore cannot receive output, then no cgm output will be written. Otherwise, the new file is opened.

There are two modes for saving a cgm file: ‘append’ mode appends cgm output to an existing cgm file; ‘replace’ mode overwrites an existing cgm file with new cgm output.

Assignments

CGM([path/file name], mode)

where mode is either ‘append’ or ‘replace’.

Script Examples

Append to an existing file:

CGM(/home/williams/example.cgm,append)

Replace an existing file:

CGM(/home/williams/example.cgm,replace)

VCS Scripts: Script Command: Clear

Description

The Clear script command removes the display table entry associated with a specified display name; if the VCS Canvas is open, the display table’s graphical representation will be cleared from it as well.

Assignments

Clear(specification)

where specification is either ‘display_name’ or ‘all’. If ‘all’ is specified, then all display table entries will be cleared, and the entire VCS Canvas (if open) also will be cleared.

Script Examples

Clear the specified display:

Clear(display_0)

Clear all displays and plots:

Clear(all)

VCS Scripts: Script Command: Color

Description

The table of color attribute sets may contain many entries, but only one is active at any given instant. (There is *always* an active color table.) The Color command assigns one of the table entries as the active color table.

Assignments

Color(color_table_name)

Script Example

Example of a Color script:

Color(AMIP)

VCS Scripts: Script Command: Control

Description

Upon initiation of the VCS interface, the Control command directs the interface to display the Main Menu in "compact view" or "full view" (see VCS Setup Information on the Main Menu for further explanation). The ‘power’ option, displays the Main Menu in full view, and the ‘dummy’ option displays it in compact view.

Assignments

Control(option)

where option is either **‘power’** or **‘dummy’**

Script Examples

Display the main menu in full view:

Control(power)

Display the main menu in compact view:

Control(dummy)

VCS Scripts: Script Command: Copy

Description

The Copy command copies one attribute set to another, where the new set is designated by a different name. A table entry is also set up for the new attribute set. Note, the Display attribute set cannot be copied.

Assignments

Copy(prefix_old, prefix_new)

where **prefix_old** is the table prefix and the old attribute set name and **prefix_new** is the table prefix and the new attribute set name.

Script Examples

Some examples of Copy scripts:

Copy(A_psl,A_example)

Copy(Tt_std,Tt_example)

Copy(Th_AMIP,Th_example)

Copy(Tf_AMIP27,Tf_example)

Copy(Tm_AMIP,Tm_example)

Copy(Tl_red,Tl_example)

Copy(Gfb_AMIP,Gfb__example)

Copy(L_p_levels, L_example)

Copy(P_AMIP,P_example)

VCS Scripts: Script Command: DRS

Description

The DRS command is used to store data attribute sets in the PCMDI Data Retrieval and Storage (DRS) format. If no path/file name is given and no previously created DRS file has been designated, then file

/$HOME/PCMDI_GRAPHICS/default.dic

will be used as the DRS dictionary (i.e., data metafile) and file

/$HOME/PCMDI_GRAPHICS/default.dat

will be used for storing DRS data. However, if a previously created DRS file is designated, that file will be used for DRS output.

There are two modes for saving a DRS file: 'append' mode appends DRS output to an existing file; 'replace' mode overwrites an existing file with DRS output. If a file cannot be opened for appending output, then no DRS output will be written.

Assignments

DRS([path/file name], variable array, mode)

where **mode** is either **'append'** or **'replace'**

Script Examples

Append to an existing file:

DRS(/home/williams/example.dic,append)

Replace an existing file:

DRS(/home/williams/example.dic,replace)

VCS Scripts: Script Command: Dump

Description

The Dump command dumps the state of the system, expressed in script form, to a named file.

Assignments

Dump(filename).

Script Example

Example of a Dump script:

Dump(/home/williams/example.scr)

VCS Scripts: Script Command: HDF

Description

The HDF command is used to store data attribute sets in the Hierarchical Data Format (HDF) format developed by the National Center for Supercomputing Applications (NCSA). If no path/file name is given and no previously created HDF file has been designated, then file

/$HOME/PCMDI_GRAPHICS/default.hdf

will be used for HDF output. However, if a previously created HDF file is designated, that file will be used for HDF output.

There are two modes for saving an HDF file: 'append' mode appends HDF output to an existing file; 'replace' mode overwrites an existing file with HDF output. If a file cannot be opened for appending output, then no HDF output will be written.

Assignments

HDF([path/file name], variable array, mode)

where **mode** is either **'append'** or **'replace'**

Script Examples

Append to an existing file:

HDF(/home/williams/example.hdf,append)

Replace an existing file:

HDF(/home/williams/example.hdf,replace)

VCS Scripts: Script Command: Hints

Description

The Hints command instructs the VCS interactive interface either to turn online Hints Displays on or off. This command need only be used when VCS is operated in interactive mode.

Assignments

Hints(status)

where **status** is **'on'** or **'off'**

Script Examples

Turn Hints on:

Hints(on)

Turn Hints off:

Hints(off)

VCS Scripts: Script Command: Index

Description

The Index command specifies the internally defined indices (I,J,K,L,M,N). These can be set to a positive definite value (I = i 0), incremented by one (I++), decremented by one (I--), incremented by a specified amount (I=i+), or decremented by a specified amount (I=i-). The index value must be greater than or equal to 1.

An indexed list name can be used to specify a particular element of the list. The actual index value used is the index value less one, modulo the number of values in the list. This removes any possibility of referring to nonexistent elements.

Assignments

Index([I=i] [,J=j] [,K=k] [,L=l] [,M=m] [,N=n]

or

[I+] [,J+] [,K+] [,L+] [,M+] [,N+]

or

[I-] [,J-] [,K-] [,L-] [,M-] [,N-]

or

[I=i+] [,J=j+] [,K=k+] [,L=l+] [,M=m+] [,N=n+])

Script Example

Example of an Index script:

Index(I=1,J=1,K=1,L=1,M=1,N=1)

VCS Scripts: Script Command: Loop

Description

The Loop command aids in making images of temporal sequences of variables by looping over indices (I,J,K,L,M,N). The effect is as if the following pseudo code were executed:

Loop I from i1 to i2 by di
Loop J from j1 to j2 by dj
Loop K from k1 to k2 by dk
Loop L from l1 to k2 by dk
Loop M from m1 to m2 by dm
Loop N from n1 to n2 by dn
Raster(filename)
CGM(filename)
netCDF(filename)
HDF(filename)
DRS(filename)
SLEEP(number_of_seconds)
End_all_loops

Only those indices needed to create the desired effect and only the output command that is desired, if any, should be included. The increments di, dj, etc. need not be supplied if they are +1 or -1. The sign of the increment will be set according to the relative sizes of i1 and i2, j1 and j2, etc.; just the size of the increment is retained from the user input. Commas only need be included between successive arguments.

It is, of course, necessary that the single index or indices that are looped over be used in an array data attribute that will have an effect on an active display table entry; otherwise, the loop will have no effect. Note, as it is automatically assumed that the output files will be in 'append' mode, the Raster, CGM, netCDF, HDF, and DRS commands need not specify the output mode as 'append'.

Assignments

Loop([I(first,last[,increment])]
[,][J(first,last[,increment])]
[,][K(first,last[,increment])]
[,][L(first,last[,increment])]
[,][M(first,last[,increment])]
[,][N(first,last[,increment])]
[,][CGM([file name])])
[,][Raster([file name])]
[,][netCDF([file name])]
[,][HDF([file name])]
[,][DRS([file name])]

Script Examples

Examples of using Loop scripts:

Loop(I(1,12,1),cgm(/home/williams/example.cgm))

Loop(I(1,12,2),cgm(/home/williams/example.ras))

Loop(I(1,12,3),cgm(/home/williams/example.nc))

Loop(I(6,12,4),raster(/home/williams/example.hdf))

VCS Scripts: Script Command: netCDF

Description

The netCDF command is used to store data attribute sets in the Network Common Data Form (netCDF) format developed by the Unidata Program of the National Science Foundation (NSF) Division of the Atmospheric Sciences. If no path/file name is specified and no previously created netCDF file has been designated, then file

/$HOME/PCMDI_GRAPHICS/default.nc

will be used for storing netCDF output. However, if a previously created netCDF file is designated, that file will be used for netCDF output.

There are two modes for saving a netCDF file: 'append' mode appends netCDF output to an existing netCDF file; 'replace' mode overwrites an existing file with netCDF output. If a file cannot be opened for appending output, then no netCDF output will be written.

Assignments

netCDF([path/file name], variable array, mode)

where **mode** is either 'append', or 'replace'.

Script Examples

Append to an existing file:

netCDF(/home/williams/example.nc,append)

Replace an existing file:

netCDF(/home/williams/example.nc,replace)

VCS Scripts: Script Command: Overlay_Continents

Description

The Overlay_Continents command displays the attribute set names and assignment values of the Continents graphics method. The continents graphics method displays a predefined, generic set of continental outlines in a longitude by latitude space.

Assignments

Overlay_Continents(continent_number)

where **continent_number** is an integer between **1** and **12** such that

0 signifies "No" continents

1 signifies "Fine" continents, internal data

2 signifies "Coarse" continents, internal data

3 signifies "United States", the external file ***data_continent_states***

4 signifies "Political Borders", the external file ***data_continent_political***

5 signifies "Rivers", the external file ***data_continent_river***

6 through **12** signify the line type defined by the files ***data_continent_other6*** through ***data_continent_other12***

See the Setup Information on VCS Continents Mapping Options for further details.

Script Example

Example of an Overlay_Continents script:

Overlay_Continents(3)

VCS Scripts: Script Command: Page

Description

The orientation of the VCS Canvas and of cgm and raster images is controlled by the Page command. Only portrait (y x) or landscape (x y) orientations are permitted.

Assignments

Page(orientation)

where orientation is either 'portrait' or 'landscape'

Script Examples

Landscape mode:

Page(landscape)

Portrait mode:

Page(portrait)

VCS Scripts: Script Command: Raster

Description

The Raster command is used to store data attribute sets as raster images. If no path/file name is given and no previously created raster file has been designated, then file

/$HOME/PCMDI_GRAPHICS/default.ras

will be used for storing raster images. However, if a previously created raster file is designated, that file will be used for raster output.

There are two modes for saving a raster file: 'append' mode appends raster output to an existing raster file; 'replace' mode overwrites an existing raster file with raster output. If a file cannot be opened for appending output, then no raster images will be written. *Note. VCS saves raster images in Sun raster format.*

Assignments

RASTER([path/file name], mode)

where ***mode*** *is either* ***'append'*** *or* ***'replace'***

Script Examples

Append to an existing file:

RASTER(/home/williams/example.ras,append)

Replace an existing file:

RASTER(/home/williams/example.ras,replace)

VCS Scripts: Script Command: Remove

Description

The Remove command is used to remove a named attribute set from its table. Because this command impacts most attribute sets, the full attribute set name (including prefix identifier) must be specified. *Note, the Display and Pattern attribute sets cannot be removed*.

Assignments

Remove(prefix _attribute set name).

Script Examples

Some examples of Remove scripts:

Remove(A_psl)

Remove(Tt_std)

Remove(Th_AMIP)

Remove(Tf_AMIP27)

Remove(Tm_AMIP)

Remove(Tl_red)

Remove(Gfb_AMIP)

Remove(L_p_levels)

Remove(P_AMIP)

VCS Scripts: Script Command: Rename

Description

The Rename command renames an attribute set. Because this command impacts most attribute sets, the full attribute set name (including prefix identifier) must be specified. *Note, attribute sets used in a picture (e.g., the Display, Pattern, and Color Table attribute sets) cannot be renamed.*

Assignments

Rename(prefix_old attribute set name, prefix_new attribute set name).

Script Examples

Some examples of Rename scripts:

Rename(A_psl,A_example)

Rename(Tt_std,Tt_example)

Rename(Th_AMIP,Th_example)

Rename(Tf_AMIP27,Tf_example)

Rename(Tm_AMIP,Tm_example)

Rename(Tl_red,Tl_example)

Rename(Gfb_AMIP,Gfb__example)

Rename(L_p_levels, L_example)

Rename(P_AMIP,P_example)

VCS Scripts: Script Command: Run

Description

The Run command executes a script file. Control then will return to the current script file.

Assignments

Run(script_file)

Script Example

Example of a Run script:

Run(/home/williams/example.scr)

VCS Scripts: Script Command: Sleep

Description

The Sleep command causes a pause in the Loop process for a specified number of seconds.

Assignments

Sleep(seconds)

Script Example

Example of a Sleep script:

Loop(I(1,12,1),SLEEP(18))